CUMMINS POWER SYSTEMS, LLC

1907 Park 100 Drive
Glen Burnie, Maryland 21061
(410) 590-8700
Toll Free (800) 783-7061

Prepared for:

Northwest Electric

12442 Owings Mills Road

Owings Mills, MD 21136
Attn: Steve Porter

Project: The Palisades @Arundel Preserve

Prepared by:

Sebastian Theberge

Our energy working for you.™

Power Generation

BILL of MATERIALS

Cummins Power Systems, LLC
1907 Park 100 Drive
Glen Burnie MD 21061 United States
Direct: (410) 762-1424

April 20, 2012

Northwest Electric, Inc.
12442 Owings Mills Blvd.
Owings Mills MD 21136 United States
Main: (410) 526-4555
Fax No: (410) 526-4554

Attention: Steve Porter

Project Name: The Palisades @ Arundel Preserve - 1000 kW
Quotation: 461000000512920A **Project Number: P212249**

Thank you for your inquiry. We are pleased to quote as follows:

Item	Description	Qty
	Diesel Genset: 60Hz-1000/900kW	
Install-US-Stat	U.S. EPA, Stationary Emergency Application	1
1000DQFAD	Genset-Diesel,60Hz,1000kW	1
A331-2	Duty Rating-Standby Power	1
L090-2	Listing-UL 2200	1
L170-2	EmissionCert,EPA,Tier 2,NSPS CI Stationary Emergency	1
F202-2	Enclosure-Steel,SndAtt,Level 2,Base Mtd,w/ExhSys	1
C252-2	Fuel Tank-Subbase,2000 Gallon,UL142 Compliant	1
R002-2	Voltage-277/480,3 Phase,Wye,4 Wire	1
B252-2	Alternator-60 Hz, 12 Lead, Broad Range, 125/105C	1
H611-2	SetCntl-PCC,Basic,NoAlpha/AnalgDisp	1
H613-2	Paralleling-IsolatedBus,Automatic	1
H536-2	Display Language-English	1
H605-2	Display-Control,Graphical	1
H606-2	Meters-AC Output,Analog	1
K911-2	Shutdown Alarm Relay-3PDT	1
K974-2	Run Relays-Three 3 Pole Double Throw	1
KA08-2	Alarm-Audible, Engine Shutdown	1
KP60-2	Interface-CommunicationsNtwk,FTT-10	1
KP74-2	Stop Switch-Emergency,Externally Mounted	1
H609-2	Control Mounting-Left Facing	1
A292-2	Heater-Alternator, 120 Volt AC	1

KP81-2	Circuit Breaker Or Entrance Box-Right & Left Side	1
KP87-2	CB-1600A,3P,600/690V,UL/IEC,ServEnt,100%UL,Left	1
KP92-2	CB-600A,3P,600/690V,UL/IEC,ServEnt,100%UL,Right	1
	CB-300A,3P,600/690V,UL/IEC,ServEnt,80%UL,Right – Fire Pump	1
KP99-2	Ckt Brkr Access, 24VDC Trip, Aux&Trip Contacts,LS	1
H668-2	Indication-Ground Fault, 4-Pole XfrSw&Ckt Brkr, RS	1
KP98-2	Ckt Brkr Access, 24VDC Trip, Aux&Trip Contacts,RS	1
P175-2	Enclosure Color-Green,Steel Enclosure	1
L163-2	Listing, ULC-S601-07	1
F208-2	Cooling Air Outlet-Horizontal ,Sound Attenuated	1
F211-2	Louvers-Air Inlet,24VAC Motor Closed,Spring Opened	1
KS47-2	Enclosure Lighting-120 VAC	1
K102-2	ServiceReceptacle-120V,20A,ExternalGFCI,NEMA 5-20R	1
F224-2	Louvers-Air Outlet, Gravity Close	1
H657-2	Distribution Panel-Prewired AC Features	1
C215-2	Alarm-High Fuel Fill	1
C127-2	Separator-Fuel/Water	1
C256-2	Fuel Tank Connection-Dual Stub Up	1
B786-2	Battery Charger-12 Amp, Regulated	1
E126-2	EngineCooling-Enhanced HighAmbient Air Temperature	1
H389-2	Shutdown-Low Coolant Level	1
E098-2	Sight Glass-Coolant Level	1
H557-2	Coolant Heater-208/240/480V, Below 40F Ambient Temp	1
D041-2	Engine Air Cleaner-Normal Duty	1
L016-2	Factory Test-Extended, Standby Load, 2 Hour @ 0.8 PF	1
L026-2	Factory Test Record-Certified	1
L030-2	Genset Warranty- Standby Basic Extended, 5 Years / 1,500 Hours	1
L050-2	Literature-English	1
A412-2	Packing-Base Mtd Housing	1
SPEC-E	Product Revision - E	1
0541-0814-02	Annunciator Kit-w/Enclosure	1
	Start-up & Testing (Straight Time)	1
	Group 8D Battery	4
	Delivery	1
	2 Hour Jobsite Load Bank Test @ 1.0 PF	1
OTEC800	**Transfer Switch-Electronic Control,800Amp**	**1**
A029-7	Poles-4	1
A046-7	Listing-UL 1008/CSA Certification	1
A044-7	Frequency-60 Hertz	1
A042-7	System-3 Phase,3 Wire Or 4 Wire	1
R026-7	Voltage-480 Vac	1
B001-7	Cabinet-Type 1	1
M034-7	Genset Starting Battery-24VDC	1
C027-7	Cover-Switch Control, Security	1
J030-7	Clock-Exercise, External	1
M032-7	Relay-Elevator Signal	1

G007-7	Transfer Switch Warranty-5 Yr Comprehensive	1
SPEC-A	Product Revision - A	1
OTEC600	**Transfer Switch-Electronic Control,600Amp**	**1**
A028-7	Poles-3 (3 Phase, 3 Wire Mechanical Load for Chiller)	1
A046-7	Listing-UL 1008/CSA Certification	1
A044-7	Frequency-60 Hertz	1
A042-7	System-3 Phase,3 Wire Or 4 Wire	1
R026-7	Voltage-480 Vac	1
B001-7	Cabinet-Type 1	1
M034-7	Genset Starting Battery-24VDC	1
C027-7	Cover-Switch Control, Security	1
M032-7	Relay-Elevator Signal	1
G007-7	Transfer Switch Warranty-5 Yr Comprehensive	1
SPEC-A	Product Revision - A	1
OTEC225	**Transfer Switch-Electronic Control,225Amp**	**1**
A029-7	Poles-4	1
A046-7	Listing-UL 1008/CSA Certification	1
A044-7	Frequency-60 Hertz	1
A042-7	System-3 Phase,3 Wire Or 4 Wire	1
R026-7	Voltage-480 Vac	1
B001-7	Cabinet-Type 1	1
M034-7	Genset Starting Battery-24VDC	1
C027-7	Cover-Switch Control, Security	1
M032-7	Relay-Elevator Signal	1
G007-7	Transfer Switch Warranty-5 Yr Comprehensive	1
SPEC-A	Product Revision - A	1
OTEC400	**Transfer Switch-Electronic Control,400Amp**	**1**
A029-7	Poles-4	1
A046-7	Listing-UL 1008/CSA Certification	1
A044-7	Frequency-60 Hertz	1
A042-7	System-3 Phase,3 Wire Or 4 Wire	1
R026-7	Voltage-480 Vac	1
B001-7	Cabinet-Type 1	1
M034-7	Genset Starting Battery-24VDC	1
C027-7	Cover-Switch Control, Security	1
M032-7	Relay-Elevator Signal	1
G007-7	Transfer Switch Warranty-5 Yr Comprehensive	1
SPEC-A	Product Revision - A	1

Terms: Net 30 Days with Credit Approval.
No Fuel, Fuel Piping or main storage tank.
No additional exhaust piping, insulation, hangers or wall thimble.
No additional ductwork or louvers.
No offloading or rigging at the jobsite. Shipped via roll-back or open truck.

Start-up & Testing is to be done on regular time.
If Load Bank testing is included, adequate access must be provided.
Pricing is valid for 30 days.
Pricing does not include taxes. Taxes will be applied at the appropriate rates unless we receive a tax exempt certificate.
Electrical Permits, Emissions Permits or Emissions Testing are excluded from our scope of supply.
All pricing is for current EPA regulations. Tier 4 Emissions requirements are NOT included in the above pricing unless explicitly stated. Delays in release of equipment that are affected by this emissions change are not included in the above pricing.

CLARIFICATIONS/EXCEPTIONS:
We are including our standard jobsite testing as listed in this proposal only. Additional site testing is not included unless explicitly stated in this proposal.

Submitted by	**Accepted by**
_____	_____
Sebastian Theberge , Sales Engineer	**Name**
Seb.Theberge@Cummins.com	**Taxable (Y or N)_____ Rate (%) _____**
Fax: (410) 590-8731	**Purchase Order # _____**

Cummins Power Systems, LLC.
1907 Park 100 Drive
Glen Burnie, MD 21061
Phone: 410-590-8700
Fax: 410-590-8731

PLEASE READ CAREFULLY THE FOLLOWING BEFORE RECEIVING AND *INSTALLING THIS EQUIPMENT.*

NOTE: An installation manual is supplied with the unit. Please refer to it for Guidance and recommended procedures.

DELIVERY:

1. **If we do not deliver batteries with the generator, our technician will deliver them at the time of the start-up.**

2. **Please check all items on the packing slip. If there are any backorders or short shipped items, please inform us immediately and we will expedite the items for you.**

3. **We deliver most of our gensets on a flat bed truck with a tilt bed to enable sliding off. There is no crane on the truck. For larger gensets, a crane is necessary to unload this equipment, and we are not responsible for offloading rigging equipment.**

4. **One set of operation and maintenance manuals and a parts book is supplied with the genset and automatic transfer switch. Additional sets, if included in the project are mentioned in our submittal package. Please do not lose them. Additional sets can be purchased from our parts department.**

5. **Housed units and transfer switches are delivered with keys. Please be sure to secure the keys to prevent loss.**

INSTALLATION:

1. **Foundation holes on Cummins/Onan Gensets are not always visible from the exterior of the skid. Please check the mounting positions carefully from the submittal drawings supplied for proper installation of the unit and vibration isolators.**

2. **For indoor installations, unless otherwise specified, we normally supply an exhaust flex pipe and muffler. Piping and hardware items are not supplied by us. The mechanical contractor provides these items.**

3. **For outdoor installations, we supply either a factory installed housing with mounted muffler or a dropover enclosure wherein we supply the housing, muffler, flex pipe, flanges and a rain cap/tail piece as loose items. These require installation by the electrical and mechanical contractor. A crane is required at the site to lift the housing over the genset and place the silencer on the housing.**

(Cont'd)

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4. **All gensets are supplied with lubrication oil and coolant. If rigging will involve tilting of the genset, please advise us before delivery so that we can deliver the unit dry. Our technician will fill the lubrication oil and coolant after installation.**

5. **Lifting of genset and equipment should involve rigging as level as possible. Excessive tilting may topple the unit.**

6. **For indoor installations, please do not install mufflers or piping too close to sprinklers or any other equipment sensitive to the heat produced by the exhaust system.**

7. **Exhaust flex pipes provided with mufflers are not to be bent during installation. These pipes should be installed as straight as possible.**

8. **We provide flexible connections for the fuel connections on the genset only. All other piping between main fuel tank, daytank and genset is supplied by others. Do not use galvanized steel for fuel pipes. Fuel must be available in the main storage tank, subbase tank and day tank prior to start-up. We do not supply fuel for start-up.**

9. **Skid-base tanks are supplied bolted underneath the generator set. Fuel pipes are installed in our shop before delivery.**

10. **Interconnection wiring between the genset, automatic transfer switch and remote annunciator must be completed prior to start-up. Load wiring should be terminated prior to start-up. Cummins/Onan annunciator panels are designed for either 12 or 24 volts DC system. Please ensure it is connected for the proper voltage or damage will occur. Please note that for Onan 200kW through 1500kW gensets customer connections are placed behind the panel inside the PCC interconnection enclosure. This is clearly indicated on the installation drawing of the genset.**

11. **Unless otherwise specified, the main circuit breaker on the generator is on the left hand side looking at the control panel. Stub up space is indicated on genset drawing in the submittal.**

12. **The battery charger must be mounted and wired prior to start-up. Do not energize the charger without batteries connected as damage may occur. The charger should not be mounted on the genset as the vibration will void the warranty.**

13. **Power and alarm wiring for the fuel daytank must be completed prior to start-up.**

14. **Power wiring to the jacket water heater or oil heater must be completed prior to start-up. Do not energize the circuit as damage may occur to the heater.**

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15. **If a rodentproof modification is specified for the generator set, please be advised that we deliver the set with the bottom open to enable installation. We close the bottom during start-up of the genset. Installer will be responsible for any rodent damage caused during installation work.**

TESTING:

1. **One start-up trip to the jobsite is included in the project. Therefore, it is imperative that before you call us for a start-up date, please ensure that installation of the genset is complete in every aspect. Additional trips due to incomplete or improper genset installation will be invoiced at our normal rates.**

2. **If a load bank test is involved on the project, we will provide the load banks. Rigging is not included and the contractor is responsible for placement at a proper location. We do not recommend more than 50' of cable between load bank and the generator and as a load bank produces considerable heat, a proper location is required to complete the testing. Load bank testing cannot be performed in the rain.**

3. **If a demonstration of the system to owner personnel is included on the project, please insure owner representatives are present during start-up. Additional trips for demonstration will be billed at our normal rates.**

4. **All field services will be performed during regular business hours. Overtime is not included.**

Diesel generator set
QST30 series engine

> Specification sheet
680 kW - 1000 kW 60 Hz

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Description

Cummins Power Generation commercial generator sets are fully integrated power generation systems providing optimum performance, reliability and versatility for stationary standby and prime power applications. Codes may not be available with all model configurations – consult factory for availability.

This generator set is designed in facilities certified to ISO 9001 and manufactured in facilities certified to ISO 9001 or ISO 9002.

The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design. Cummins Power Generation products bearing the PTS symbol meet the prototype test requirements of NFPA 110 for Level 1 systems.

All low voltage models are CSA certified to product class 4215-01.

The generator set is available listed to UL 2200, Stationary Engine Generator Assemblies for all 60 Hz low voltage models. The PowerCommand control is Listed to UL 508 - Category NITW7 for U.S. and Canadian usage. Circuit breaker assemblies are UL 489 Listed for 100% continuous operation and also UL 869A Listed Service Equipment.

U.S. EPA Engine certified to Stationary Emergency U.S. EPA New Source Performance Standards, 40 CFR 60 subpart IIII Tier 2 exhaust emission levels. U.S. applications must be applied per this EPA regulation.

Features

Cummins® heavy-duty engine - Rugged 4-cycle, industrial diesel delivers reliable power, low emissions and fast response to load changes.

Alternator - Several alternator sizes offer selectable motor starting capability with low reactance 2/3 pitch windings, low waveform distortion with non-linear loads and fault clearing short-circuit capability.

Permanent magnet generator (PMG) - Offers enhanced motor starting and fault clearing short-circuit capability.

Control system - The PowerCommand® electronic control is standard equipment and provides total genset system integration including automatic remote starting/stopping, precise frequency and voltage regulation, alarm and status message display, AmpSentry™ protection, output metering, auto-shutdown at fault detection and NFPA 110 Level 1 compliance.

Cooling system - Standard integral set-mounted radiator system, designed and tested for rated ambient temperatures, simplifies facility design requirements for rejected heat.

NFPA - The genset accepts full rated load in a single step in accordance with NFPA 110 for Level 1 systems.

Warranty and service - Backed by a comprehensive warranty and worldwide distributor network.

	Standby rating		Prime rating		Continuous rating		Data sheets	
Model	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz	50 Hz
DQFAA	750 (938)		680 (850)				D-3329	
DQFAB	800 (1000)		725 (907)				D-3330	
DQFAC	900 (1125)		818 (1023)				D-3331	
DQFAD	1000 (1250)		900 (1125)				D-3332	

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S-1508g (7/10)

Generator set specifications

Governor regulation class	ISO8328 Part 1 Class G3
Voltage regulation, no load to full load	± 0.5%
Random voltage variation	± 0.5%
Frequency regulation	Isochronous
Random frequency variation	± 0.25%
Radio frequency emissions compliance	IEC 801.2 through IEC 801.5; MIL STD 461C, Part 9

Engine specifications

Bore	140 mm (5.51 in)
Stroke	165.0 mm (6.5 in)
Displacement	30.5 litres (1860 in^3)
Configuration	Cast iron, V 12 cylinder
Battery capacity	1800 amps minimum at ambient temperature of -18 °C to 0 °C (0 °F to 32 °F)
Battery charging alternator	35 amps
Starting voltage	24 volt, negative ground
Fuel system	Direct injection: number 2 diesel fuel, fuel filter, automatic electric fuel shutoff
Fuel filter	Triple element, 10 micron filtration, spin-on fuel filter with water separator
Air cleaner type	Dry replaceable element
Lube oil filter type(s)	Four spin-on, combination full flow filter and bypass filters
Standard cooling system	High ambient radiator

Alternator specifications

Design	Brushless, 4 pole, drip proof revolving field
Stator	2/3 pitch
Rotor	Single bearing, flexible discs
Insulation system	Class H on low and medium voltage, Class F on high voltage
Standard temperature rise	150 ºC standby at 40 °C
Exciter type	PMG (permanent magnet generator)
Phase rotation	A (U), B (V), C (W)
Alternator cooling	Direct drive centrifugal blower fan
AC waveform total harmonic distortion	< 5% no load to full linear load, < 3% for any single harmonic
Telephone influence factor (TIF)	< 50 per NEMA MG1-22.43
Telephone harmonic factor (THF)	< 3

Available voltages

60 Hz line-neutral/line-line				**50 Hz line-neutral/line-line**			
• 120/208 • 139/240	• 220/380 • 230/400	• 240/416 • 277/480	• 347/600				

* Note: Consult factory for other voltages.

Generator set options and accessories

Engine
- ☐ 208/240/480 V coolant heater for ambient above 4.5 °C (40 °F)
- ☒ 208/240/480 V coolant heater for ambient below 4.5 °C (40 °F)

Control panel
- ☐ 120/240 V 100 W control anti-condensation heater
- ☒ Paralleling configuration
- ☐ Remote fault signal package
- ☒ Run relay package

Alternator
- ☐ 80 °C rise
- ☒ 105 °C rise
- ☐ 125 °C rise
- ☒ 120/240 V 300 W, anti-condensation heater
- ☐ Temperature sensor - RTDs, 2/phase
- ☐ Temperature sensor – alternator bearing RTD
- ☐ Differential current transformers

Exhaust system
- ☐ Industrial grade exhaust silencer
- ☐ Residential grade exhaust silencer
- ☒ Critical grade exhaust silencer

Cooling system
- ☐ Remote radiator

Generator set
- ☐ AC entrance box
- ☒ Battery
- ☐ Battery rack with hold-down - floor standing
- ☒ Circuit breaker - set mounted
- ☐ Disconnect switch - set mounted
- ☐ PowerCommand Network
- ☒ Remote annunciator panel
- ☒ Spring isolators
- ☐ 2 year warranty
- ☒ 5 year warranty
- ☐ 10 year major components warranty

* Note: Some options may not be available on all models - consult factory for availability.

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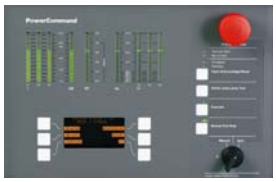
S-1508g (7/10)

Power Generation

Control system PCC 3201



PowerCommand control is an integrated generator set control system providing governing, voltage regulation, engine protection and operator interface functions. Major features include:

- Integral AmpSentry™ Protective Relay providing a full range of alternator protection functions that are matched to the alternator provided.
- Battery monitoring and testing features and smart starting control system.
- Three phase sensing, full wave rectified voltage regulation system, with a PWM output for stable operation with all load types.
- Control suitable for operation in ambient temperatures from -40 °C to +70 °C (-40 °F to +158 °F) and altitudes to 5000 meters (13,000 feet).
- Prototype tested; UL, CSA, and CE compliant.
- InPower™ PC-based service tool available for detailed diagnostics.
- Optional Echelon® LONWORKS® network interface.

Operator/display panel

- Off/manual/auto mode switch
- Manual run/stop switch
- Panel lamp test switch
- Emergency stop switch
- Exercise switch
- Alpha-numeric display with pushbutton access for viewing engine and alternator data and providing setup, controls and adjustments
- LED lamps indicating not in auto, common warning, common shutdown, remote start
- Configurable for local language

Engine protection

- Overspeed shut down
- Low oil pressure warning and shut down
- High coolant temperature warning and shut down
- High oil temperature warning
- Low coolant level warning or shut down
- Low coolant temperature warning
- High and low battery voltage warning
- Weak battery warning
- Dead battery shut down
- Fail to start (overcrank) shut down
- Fail to crank shut down
- Redundant start disconnect
- Cranking lockout
- Sensor failure indication

Engine data

- DC voltage
- Lube oil pressure
- Coolant temperature
- Lube oil temperature
- Engine speed
- Engine ECM data

AmpSentry AC protection

- Over current and short-circuit shut down
- Over current warning
- Single and three phase fault regulation
- Over and under voltage shut down
- Over and under frequency shut down
- Overload warning with alarm contact
- Reverse power and reverse Var shut down

Alternator data

- Line-to-line and line-to-neutral AC volts
- Three phase AC current
- Frequency
- Total and individual phase power factor, kW and kVA
- Bus voltage and frequency (with paralleling options)

Other data

- Genset model data
- Start attempts, starts, running hours
- kW hours (total and since reset)
- Fault history
- Load profile (accessible with InPower)

Governing

- Digital electronic isochronous governor
- Temperature dynamic governing
- Smart idle speed mode

Voltage regulation

- Digital PWM electronic voltage regulation
- Three phase line-to-neutral sensing
- Single and three phase fault regulation
- Configurable torque matching

Control functions

- Data logging on faults
- Fault simulation (requires InPower)
- Time delay start and cooldown
- Cycle cranking
- Configurable customer outputs (4)
- Configurable network inputs (8) and outputs (16) (with optional network)
- Remote emergency stop

Paralleling (Option)

- Active digital phase lock loop synchronizer
- Isochronous kW and kVar load sharing controls
- kW import/export and kVar/PF control for utility (mains) paralleling

Options

- ☐ Thermostatically controlled space heater
- ☐ Key-type mode switch
- ☑ Ground fault module
- ☑ Auxiliary relays (3)
- ☐ Echelon LONWORKS interface
- ☐ Modion Gateway to convert to Modbus (loose)
- ☐ PowerCommand iWatch web server for remote monitoring and alarm notification (loose)
- ☐ Digital input and output module(s) (loose)
- ☑ Remote annunciator (loose)
- ☑ Paralleling
- ☐ Power transfer control

For further detail see document S-1444.

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Cummins Power Generation

Ratings definitions

Emergency standby power (ESP):

Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Limited-time running power (LTP):

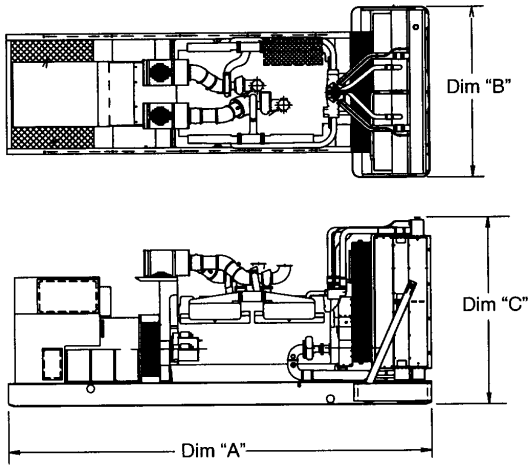
Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.

Prime power (PRP):

Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Base load (continuous) power (COP):

Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.



This outline drawing is for reference only. See respective model data sheet for specific model outline drawing number.

Do not use for installation design

Model	Dim "A" mm (in.)	Dim "B" mm (in.)	Dim "C" mm (in.)	Set Weight* dry kg (lbs)	Set Weight* wet kg (lbs)
DQFAA	4338 (170.7)	2000 (79)	2353 (93)	6673 (14707)	6971 (15363)
DQFAB	4338 (170.7)	2000 (79)	2353 (93)	6696 (15199)	7194 (15855)
DQFAC	4338 (170.7)	2000 (79)	2353 (93)	7375 (16254)	7672 (16910)
DQFAD	4338 (170.7)	2000 (79)	2353 (93)	7633 (16824)	7931 (17480)

* Note: Weights represent a set with standard features. See outline drawings for weights of other configurations.

Cummins Power Generation
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Telephone: 763 574 5000
Fax: 763 574 5298

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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S-1508g (7/10)

Power Generation

Model: DQFAD
Frequency: 60
Fuel type: Diesel
KW rating: 1000 standby
900 prime
Emissions level: EPA NSPS Stationary Emergency Tier 2

Generator set data sheet

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Exhaust emission data sheet:	**EDS-1063**
Exhaust emission compliance sheet:	**EPA-1097**
Sound performance data sheet:	**MSP-1038**
Cooling performance data sheet:	**MCP-156**
Prototype test summary data sheet:	**PTS-266**
Standard set-mounted radiator cooling outline:	**0500-4391**
Optional set-mounted radiator cooling outline:	
Optional heat exchanger cooling outline:	
Optional remote radiator cooling outline:	**0500-4390**

Fuel consumption

	Standby				**Prime**				**Continuous**
	kW (kVA)				**kW (kVA)**				**kW (kVA)**
Ratings	1000 (1250)				900 (1125)				
Load	**1/4**	**1/2**	**3/4**	**Full**	**1/4**	**1/2**	**3/4**	**Full**	**Full**
US gph	19.1	35.8	54.1	72.2	17.3	32.1	47.5	63.9	
L/hr	72.3	135.5	204.8	273.3	65.5	121.5	179.8	241.9	

Engine

	Standby rating	**Prime rating**	**Continuous rating**
Engine manufacturer	Cummins Inc.		
Engine model	QST30-G5 NR2		
Configuration	Cast iron, V 12 cylinder		
Aspiration	Turbocharged and low temperature aftercooled		
Gross engine power output, kWm (bhp)	1112 (1490)	1007 (1350)	
BMEP at set rated load, kPa (psi)	2417 (351)	2160 (313)	
Bore, mm (in)	140 (5.51)		
Stroke, mm (in)	165 (6.5)		
Rated speed, rpm	1800		
Piston speed, m/s (ft/min)	9.91 (1950)		
Compression ratio	14.7:1		
Lube oil capacity, L (qt)	154 (162.8)		
Overspeed limit, rpm	2100 ±50		
Regenerative power, kW	82		

Fuel flow

Maximum fuel flow, L/hr (US gph)	570 (150)	
Maximum fuel inlet restriction, kPa (in Hg)	27 (8.0)	
Maximum fuel inlet temperature, °C (°F)	66 (150)	

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D-3332e (7/10)

Air	Standby rating	Prime rating	Continuous rating
Combustion air, m^3/min (scfm)	88 (3150)	81 (2880)	
Maximum air cleaner restriction, kPa (in H_2O)	6.2 (25)		
Alternator cooling air, m^3/min (cfm)	204 (7300)		

Exhaust			
Exhaust flow at set rated load, m^3/min (cfm)	211 (7540)	195 (6950)	
Exhaust temperature, °C (°F)	477 (890)	467 (873)	
Maximum back pressure, kPa (in H_2O)	6.8 (27)		

Standard set-mounted radiator cooling			
Ambient design, °C (°F)	50 (122)		
Fan load, kW_m (HP)	43 (57)		
Coolant capacity (with radiator), L (US gal)	201 (53.2)		
Cooling system air flow, m^3/min (scfm)	952 (34000)		
Total heat rejection, MJ/min (Btu/min)	48.9 (46455)	43.9 (41660)	
Maximum cooling air flow static restriction, kPa (in H_2O)	0.12 (0.5)		
Maximum fuel return line restriction kPa (in Hg)	67.5 (20)		

Optional set-mounted radiator cooling			
Ambient design, °C (°F)			
Fan load, kW_m (HP)			
Coolant capacity (with radiator), L (US gal)			
Cooling system air flow, m^3/min (scfm)			
Total heat rejection, MJ/min (Btu/min)			
Maximum cooling air flow static restriction, kPa (in H_2O)			
Maximum fuel return line restriction, kPa (in Hg)			

Optional heat exchanger cooling			
Set coolant capacity, L (US gal)			
Heat rejected, jacket water circuit, MJ/min (Btu/min)			
Heat rejected, aftercooler circuit, MJ/min (Btu/min)			
Heat rejected, fuel circuit, MJ/min (Btu/min)			
Total heat radiated to room, MJ/min (Btu/min)			
Maximum raw water pressure, jacket water circuit, kPa (psi)			
Maximum raw water pressure, aftercooler circuit, kPa (psi)			
Maximum raw water pressure, fuel circuit, kPa (psi)			
Maximum raw water flow, jacket water circuit, L/min (US gal/min)			
Maximum raw water flow, aftercooler circuit, L/min (US gal/min)			
Maximum raw water flow, fuel circuit, L/min (US gal/min)			
Minimum raw water flow at 27 °C (80 °F) inlet temp, jacket water circuit, L/min (US gal/min)			
Minimum raw water flow at 27 °C (80 °F) inlet temp, aftercooler circuit, L/min (US gal/min)			
Minimum raw water flow at 27 °C (80 °F) inlet temp, fuel circuit, L/min (US gal/min)			
Raw water delta P at min flow, jacket water circuit, kPa (psi)			
Raw water delta P at min flow, aftercooler circuit, kPa (psi)			
Raw water delta P at min flow, fuel circuit, kPa (psi)			
Maximum jacket water outlet temp, °C (°F)			
Maximum aftercooler inlet temp, °C (°F)			
Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C (°F)			
Maximum fuel return line restriction, kPa (in Hg)			

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D-3332e (7/10)

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Optional remote radiator cooling[1]	Standby rating	Prime rating	Continuous rating
Set coolant capacity, L (US gal)			
Max flow rate at max friction head, jacket water circuit, L/min (US gal/min)	992 (262)		
Max flow rate at max friction head, aftercooler circuit, L/min (US gal/min)	303 (80)		
Heat rejected, jacket water circuit, MJ/min (Btu/min)	22.67 (21500)	21.01 (19925)	
Heat rejected, aftercooler circuit, MJ/min (Btu/min)	18.35 (17400)	15.69 (14885)	
Heat rejected, fuel circuit, MJ/min (Btu/min)			
Total heat radiated to room, MJ/min (Btu/min)	6.1 (5753)	5.6 (5301)	
Maximum friction head, jacket water circuit, kPa (psi)	69 (10)		
Maximum friction head, aftercooler circuit, kPa (psi)	48 (7)		
Maximum static head, jacket water circuit, m (ft)	14 (46)		
Maximum static head, aftercooler circuit, m (ft)	14 (46)		
Maximum jacket water outlet temp, °C (°F)	104 (220)	100 (212)	
Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C (°F)	41 (105)		
Maximum aftercooler inlet temp, °C (°F)	62 (143)	56 (133)	
Maximum fuel flow, L/hr (US gph)			
Maximum fuel return line restriction, kPa (in Hg)	67.5 (20)		

Weights[2]

Unit dry weight kgs (lbs)	7633 (16824)
Unit wet weight kgs (lbs)	7931 (17480)

Notes:

[1] For non-standard remote installations contact your local Cummins Power Generation representative.

[2] Weights represent a set with standard features. See outline drawing for weights of other configurations.

Derating factors

Standby	Engine power available up to 579 m (1900 ft) at ambient temperatures up to 40 °C (104 °F). Above these elevations, derate at 3.5% per 305 m (1000 ft) and 7% per 10 °C (18 °F).
Prime	Engine power available up to 579 m (1900 ft) at ambient temperatures up to 40 °C (104 °F). Above these elevations, derate at 3.5% per 305 m (1000 ft) and 7% per 10 °C (18 °F).
Continuous	

Ratings definitions

Emergency standby power (ESP):	Limited-time running power (LTP):	Prime power (PRP):	Base load (continuous) power (COP):
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.	Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) is in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.

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Alternator data

Voltage	Connection[1]	Temp rise degrees C	Duty[2]	Single phase factor[3]	Max surge kVA[4]	Winding No.	Alternator data sheet	Feature Code
120/208-139/240	12-lead	125/105	S/P		4234	1019	ADS-312	B252
240/416-277/480	12-lead	125/105	S/P		4234	1019	ADS-312	B252
277/480	Wye, 3-phase	125/105	S/P		3866	1018	ADS-311	B276
220/380-277/480	Wye, 3-phase	125/105	S/P		4602	1018	ADS-330	B282
220/380-277/480	Wye, 3-phase	105/80	S/P		4602	1018	ADS-330	B283
210/380-277/480	Wye, 3-phase	80	S		5521	1024	ADS-331	B284
240/416-277/480	Wye	125/105	S/P		4234	1019	ADS-312	B288
347/600	3-phase	125/105	S/P		3866	1021	ADS-311	B300
347/600	3-phase	105/80	S/P		4234	1024	ADS-312	B301
347/600	3-phase	80	S		4602	1004	ADS-330	B604

Notes:

[1] Limited single phase capability is available from some three phase rated configurations. To obtain single phase rating, multipy the three phase kW rating by the Single Phase Factor[3]. All single phase ratings are at unity power factor.

[2] Standby (S), Prime (P) and Continuous ratings (C).

[3] Factor for the *Single Phase Output from Three Phase Alternator* formula listed below.

[4] Maximum rated starting kVA that results in a minimum of 90% of rated sustained voltage during starting.

Formulas for calculating full load currents:

Three phase output

$$\frac{kW \times 1000}{Voltage \times 1.73 \times 0.8}$$

Single phase output

$$\frac{kW \times SinglePhaseFactor \times}{Voltage}$$

Cummins Power Generation
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574 5000
Fax: 763 574 5298

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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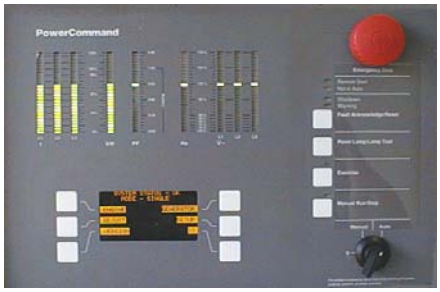
PowerCommand® 3201 digital generator set control



> Specification sheet

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Description

The PowerCommand® 3201 Control is a microprocessor-based generator set monitoring, metering and control system. The control provides an operator interface to the genset, digital voltage regulation, digital governing and generator set protective functions. It may incorporate optional automatic digital paralleling controls and/or power transfer controls. The integration of all the functions into a single control system provides enhanced reliability and performance compared to conventional control systems.

The PowerCommand control is designed for mounting on the generator set and is suitable for use on generator sets ranging in size from 20 kW to 4000 kW. It will directly read AC voltages up to 600 VAC and can be configured for any frequency, voltage and power connection configuration from 120 to 13,800 VAC. The operator panel may be remote-mounted from the generator set and connected via an RS485 network connection.

The control offers a wide range of standard control and digital display features so custom control configurations are not needed to meet application requirements and system reliability is not compromised by use of untested special components.

Power for PowerCommand Control is usually derived from the generator set starting batteries. It functions over a voltage range from 8 VDC to 35 VDC.

Features

Digital full authority electronic engine controls - Provide engine monitoring, protection and governing. These functions are integrated with voltage regulation and paralleling functions for optimum system performance.

Digital voltage regulation - Provides fast, controlled response to load changes and high levels of immunity to the effects of non-linear loads.

AmpSentry™ protective relay - UL Listed, true alternator overcurrent protection.

AC output metering - Includes analog and digital display.

Battery monitoring system - Senses and warns against weak battery condition that is not detected by conventional DC over and undervoltage monitoring.

Message display - Digital alarm and status.

Generator set monitoring - Displays status of all critical engine and alternator generator set functions.

Smart starting control system - Integrated fuel ramping to limit black smoke and frequency overshoot, in addition to optimized cold weather starting.

Advanced serviceability - Utilizes InPower™, a PC-based software service tool.

Digital power transfer control - Optional control functions that allow operation in open transition, closed transition or soft (ramping) transfer modes.

PowerCommand LonWorks® network - Optional network interface providing expanded input/output capability, remote monitoring and control by annunciators and other equipment, and easier installation.

Warranty - Backed by a comprehensive warranty and worldwide distributor service network.

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Operator panel

The operator panel provides the user with a complete package of easy to view and use information. It includes an enhanced graphical operator panel that allows the user to view up to 9 lines of information, as well as graphical displays of system data. Connections to the operator panel are sealed, locking plug interfaces for reliable, vibration-resistant interconnection to the generator set wiring harness.

Control switches and functions

Off/manual/auto mode control switch - The *not in auto* lamp will flash when the control is in the *manual* or *off* mode. In the *auto* mode, the generator set can be started using the exercise push-button or with a start signal from a remote device, such as automatic transfer switches.

Manual run/stop control switch and indicating LED - When the mode control switch is in the *manual* position and the *manual run/stop* switch is pressed, the generator set will start, bypassing all time delay starts. (Time delay idle can also be bypassed with another control action.) If the generator set is running in the *manual* mode, pressing the *run/stop* switch will cause the generator set to shut down. An LED (light emitting diode) lamp adjacent to the switch will light to indicate the generator set is in manual mode.

Exercise control switch and indicating LED - When the mode control switch is in the *auto* position the *exercise* control switch is used to complete a pre-programmed exercise sequence. All exercise functions are disabled when an emergency start command is received by the control. An LED lamp adjacent to the switch will light to indicate the generator set is in exercise mode.

Panel lamp/lamp test control switch.

Fault acknowledge/reset switch - The control includes a fault acknowledge function to allow the operator to reset the fault condition. If the fault condition is not corrected, the fault will reappear, but will not be logged as a separate event. Multiple faults can be logged and displayed at one time.

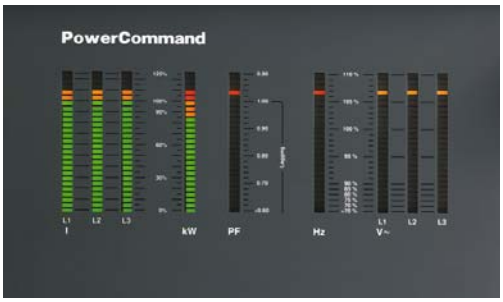
Emergency stop control switch.

Operator adjustments - The control includes provisions for many set up and adjustment functions via raise/lower switches on the operator panel. Functions that can be adjusted by the operator include:

- Time delay start (0-300 seconds)
- Time delay stop (0-600 seconds)
- Alternator voltage (±5%)
- Alternator frequency (±3 Hz)

The operator panel can be configured to require an access code prior to adjusting these values. A second access code is used to protect the control from unauthorized service level adjustments. Voltage and frequency adjustments are disabled during operation in parallel with a system bus to prevent inadvertent misadjustment of the paralleling load sharing functions.

Analog AC metering panel



The PowerCommand control is equipped with an analog AC metering panel that simultaneously displays 3-phase line-to-line AC volts and current, kW, power factor and frequency.

The meter panel is composed of a series of LEDs configured in bar graphs for each function. The LEDs are color coded with green indicating normal range values, amber for warning levels and red for shutdown conditions. Scales for each function are in % of nominal rated values.

Graphical display panel

The PowerCommand control is provided with a graphical display capable of displaying up to 9 lines of data with approximately 27 characters per line. The graphical display is accompanied by a set of six tactile-feel membrane switches that are used by the operator to navigate through control menus and to make control adjustments. Display is configurable for multiple languages. It is configurable for units of measurement. The display incorporates three levels of operation and adjustability. All data on the control can be viewed by

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scrolling through screens with the navigation keys. The top three lines of the display are allocated to mode and status messages that continuously display the operating mode of the control system, as well as any faults or warning conditions that may be present on the controller. If more than one fault or warning message is present, the messages will scroll to allow the operator to view all active messages in the system.

Screen-saver mode - The operator panel can be programmed to automatically switch off to reduce battery voltage drain when the control is not being used and the generator set is not running. Depressing any button on the operator panel, new fault conditions or receipt of a remote signal at the control will "wake up" the control.

Generator set data

Generator set hardware data - Generator set rating in kVA, complete generator set model number and serial number, engine model and serial number and alternator model and serial number. The control also displays the part number of the control and the software version present in the control.

Data logs - Number of start attempts and number of start attempts since reset. Number of times generator set has run and number of times since reset. Duration of generator set running time and duration of running time since last reset. Generator set kWh produced and kWh produced since last reset.

Adjustment history - Record of adjustment and setting changes made on the control, identifies whether adjustment was made via the operator panel or with a service tool. If a service tool is used, the control provides a record of the serial number of the tool used. This information is read with InPower.

Fault history - Record of the most recent fault conditions with time stamp, along with the number of times each fault has occurred. At least 20 events are stored in the control memory.

Load profile data - Data indicating the total operating hours at percent of load in 10% increments and since reset.

Generator set AC data

Generator set output frequency, voltage and current - All phases (line-to-line and line-to-neutral for voltage. Accuracy 1%.

Generator set power output - PowerCommand displays generator set kW and kVA output (average phase, individual phase and direction of flow) and power factor with leading/lagging indication. Accuracy 5%.

Generator set kWh energy output - Total kWh produced and total produced since last reset with time stamp of time of last reset.

Digital synchroscope - Bus voltage and frequency, generator set bus voltage and frequency, the phase angle displacement and a signal indicating "ready to close". A breaker control switch is included on this panel for convenient operation of the equipment without switching between viewing screens.

Engine data

Basic engine data - Engine starting battery voltage, engine lube oil pressure and engine coolant temperature.

Engine service data - Varies with engine used, but typically includes: Engine coolant pressure, engine fuel rail temperature and pressure, engine fuel input and output temperature, intake manifold temperature and pressure, ambient air pressure, crankcase blowby flow and aftercooler inlet coolant temperature.

Engine fuel consumption - The fuel consumed by the engine is calculated by the control based on fuel flow into the engine and returned by the engine, and the temperature of the two flow streams. Accuracy is $\pm$ 5% over 500 hours of operation. Data provided includes overall average fuel consumed and consumption since reset. This information is read with InPower.

Engine exhaust temperature (optional).

Power transfer control data (optional)

Utility (mains) source data - Displays line-to-line and line-to-neutral voltage of utility (mains) source, frequency and estimated amps, and kW and kVA supplied by utility (mains) source (optional when power transfer control is used).

System status information - Provides graphical system status display showing availability of sources and positions of each contactor.

System control - Allows operator to view status of system and manually control operation of the system. Provides manual adjustment capability for time delay start, stop, transfer and retransfer, as well as time delays for program transition (when used) and power transfer overlap time.

Internal control functions

General functions

System control voltage - The control operates on 24 VDC from the generator set starting batteries. Control functions are fully operational over a voltage range of 8 VDC to 36 VDC.

Emergency start mode - PowerCommand accepts a ground signal from remote devices or a network signal to automatically start the generator set and immediately accelerate to rated speed and voltage.

PowerCommand includes a smart starting system that is designed to quickly start the engine, minimize black smoke, minimize voltage and frequency overshoot, and

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oscillations on starting. The control system does this by careful simultaneous control of the engine fuel system and alternator excitation system.

Non-emergency start mode - The control is provided with a separate remote start input or a network signal to start the generator set via the programmable idle control. Using the non-emergency mode, the generator set takes longer to start, but there is less wear on the engine. In this start mode, the generator set will start, operate at idle speed for a predefined time period or until the engine reaches operating temperature (whichever time is shorter), and then ramp to rated speed and voltage. Time delay is adjustable from 0-300 seconds and default is 10 seconds. The control also monitors and records the source of start signals, when that information is available. The control automatically exits idle mode if an emergency remote start signal is received at the control.

Data logging - The control maintains a record of manual control operations, warning and shutdown conditions and other events. It uses the control *"on"* time as the time-stamp means when a real time clock is not included with the control. The control also stores critical engine and alternator data before and after a fault occurs, for use by InPower and the technician in evaluating the root causes for the fault condition.

Fault simulation mode - PowerCommand, in conjunction with InPower software, will accept commands to allow a technician to verify the proper operation of critical protective functions of the control by simulating failure modes or by forcing the control to operate outside of its normal operating ranges. InPower also provides a complete list of faults and settings for the protective functions of the specific generator set it is communicating with.

Built in test - The control system automatically tests itself, and all the sensors, actuators and harnesses in the control system, on a startup signal. The test can also be initiated from InPower and can be accomplished either locally to the generator set or remotely.

Engine control

Engine starting - The control operates a factory-supplied fuel valve that enables engine starting.

Cycle cranking - Configurable for number of starting cycles (1 to 7) and duration of crank and rest periods. Control includes starter protection algorithms to prevent the operator from specifying a starting sequence that might be damaging. Default setting is for (3) start cycles composed of 15 seconds of cranking and 15 seconds of rest.

Programmable idle speed control - In this mode the generator set would start and run to idle speed. It would operate at that speed for a programmed time period, then ramp to rated speed. When the control gets a signal to stop, it will ramp to idle, operate for the programmed period at idle and then shut down. During idle mode, engine protective functions are adjusted for the lower engine speed and alternator function is disabled.

Time delay start and stop (cool down) - Configurable for time delay of 0-300 seconds prior to starting after receiving a remote start signal in normal operation modes and for time delay of 0-600 seconds prior to ramp-to-idle or shutdown after signal to stop in normal operation modes. The generator set control will monitor the load during operation of the generator set, and if the total load on the set is less than 10% of rated it will reduce the operation time for the time delay stop in order to prevent extended operation of the engine at very light load levels. Default for both time delay periods is 0 seconds.

Engine governing

Isochronous governing - Controls engine speed within ± 0.25% for any steady state load from no load to full load. Frequency drift will not exceed ± 0.5% for a 33 °C (60 °F) change in ambient temperature over an 8 hour period.

Droop governing - Control can be adjusted to droop from 0 to 10% from no load to full load, using InPower.

Temperature dynamics - Modifies the engine fuel system control parameters as a function of engine temperature. Allows engine to be more responsive when warm and more stable when operating at lower temperature levels.

Isochronous load sharing control - See *Paralleling Functions/Load sharing controls*.

Droop load sharing control - See *Paralleling Functions/Load sharing controls*.

Idle mode - Engine governing can be regulated at an idle speed for a programmed period on start or stop of the engine. When the engine is operating at idle speed, the alternator excitation is automatically switched off.

Alternator control

Digital output voltage regulation - PowerCommand will regulate output voltage to within 0.5% for any loads between no load and full load. Voltage drift will not exceed ± 0.5% for a 33 °C (60 °F) change in temperature in an 8 hour period. On engine starting, or sudden load acceptance, voltage is controlled to a maximum of 5% overshoot over nominal level.

Torque-matched V/Hz overload control - The voltage roll-off set point and rate of decay (i.e., the slope of the V/Hz curve) is adjustable in the control. This function is automatically disabled when the control is in a synchronizing mode.

Fault current regulation - PowerCommand will regulate the output current on any phase to a maximum of 3 times rated current under fault conditions for both single phase and three phase faults. In conjunction with a permanent magnet generator, it will provide 3 times rated current on all phases for motor starting and short circuit coordination purposes.

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Isochronous (kVar) load sharing control - See *Paralleling Functions/Load sharing controls*.

Droop (kVar) load sharing control - See *Paralleling Functions/Load sharing controls*.

Protective functions

On a warning condition, the control will indicate a fault by lighting the warning LED on the control panel and displaying the fault name and code on the operator display panel. The nature of the fault and time of occurrence are logged in the control. The service manual and InPower service tool provide service keys and procedures based on the service codes provided.

On a shutdown condition, the control will light the shutdown LED on the control panel, display the fault name and code, initiate shutdown and lock out the generator set. The shutdown sequence of the generator set includes programmable cooldown at idle for fault conditions that do not endanger the engine. The control maintains a data log of all fault conditions as they occur and time stamps them with the controller run time and engine operating hours data. Adjustments to most set points are made using the InPower service tool.

The control system includes a *"fault bypass"* mode that forces the system to function regardless of the status of protective functions. In this mode, the only protective functions that are operational are over speed, loss of both speed sensors, moving the control switch to the *off* position or pressing the *emergency stop* switch. The control maintains a record of the time that the mode is enabled and of all warning or shutdown conditions that have occurred while in the "*fault bypass*" mode.

Many protective functions within the control system are configurable for warning, shutdown or both (2 levels). Exceptions to this include functions such as over speed conditions, and loss of speed sensing. In addition, some warning functions can incorporate control functions as a consequence of a fault.

System protective functions:

Ground fault warning (option - 600 VAC class generator sets) - Ground (earth) fault sensing is adjustable over a range of 100-1200 amps with time delays of 0-1 second. May be configured for shutdown rather than alarm.

Configurable alarm and status inputs - PowerCommand will accept up to four alarm or status inputs (contact closed to ground) to indicate customer-specified conditions. The control is programmable for warning, shutdown or status indication and for labeling the input (up to 24 characters). Sixteen additional faults can be input to the control via the network.

Breaker fail to close and breaker auxiliary contact warning or shutdown - When the paralleling control signals a circuit breaker to close, it will monitor the breaker auxiliary contacts and verify that the breaker has connected the generator set to the system bus. If the control does not sense a breaker closure within 0.5 second of the close signal, the control will monitor the phase relationship between the generator set and the bus. If this indicates that the generator set is not closed to the bus, the *"breaker fail to close"* alarm will be indicated, the breaker will be opened and the generator set shut down. If the phase relationship monitor indicates that the generator set is in parallel with the bus, "circuit breaker auxiliary contact failure" will be indicated and the generator set will continue to run in normal operation mode.

Breaker fail to open warning - The control system monitors the operation of breakers that have been signaled to open. If the breaker does not open within 1 second of initiation of signal, a *"breaker fail to open"* warning is initiated. The control will logically allow the generator set to continue to run if shutdown of the generator set with the breaker closed will cause potential damage or operating problems.

Bus or generator set PT input calibration error - The control system monitors the sensed voltage from the bus and generator set output voltage-potential transformers. When the paralleling breaker is closed, it will indicate a warning condition when they read different values.

Emergency stop - Annunciated whenever the local or remote emergency stop signal is received. Alarm panel distinguishes between local or remote operation.

AmpSentry protective relay

AmpSentry protective relay is a UL Listed comprehensive monitoring and control system integral to the PowerCommand Control System that guards the electrical integrity of the alternator and power system by providing protection against a wide array of fault conditions in the generator set or in the load. It also provides single and three phase fault current regulation so that downstream protective devices have the maximum current available to quickly clear fault conditions without subjecting the alternator to potentially catastrophic failure conditions. See document R1053 below for a full size time over current curve. The control does not include protection required for interconnection to a utility (mains) service.

Over current warning - Output current on any phase at more than 110% of rating for more than 60 seconds.

Over current shutdown (51V) - Output current on any phase is more than 110%, less than 175% of rating and approaching thermal damage point of alternator. Control includes algorithms to protect alternator from repeated over current conditions over a short period of time. The control does not include instantaneous trip functions, as they are not necessary for alternator protection and complicate short circuit coordination (discrimination).

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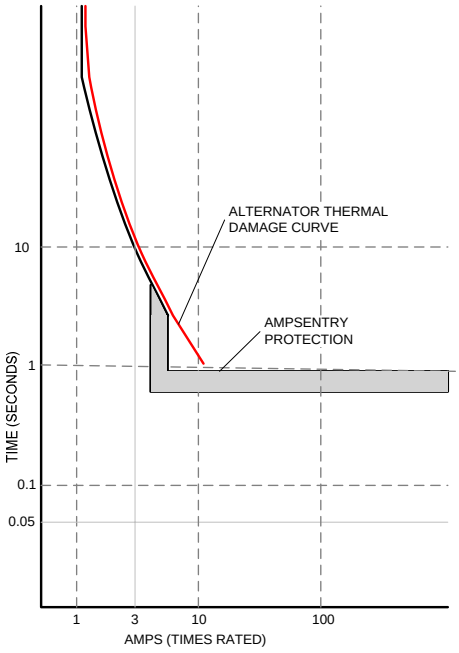

Short circuit shutdown (51) -Output current on any phase is more than 175% of rating at time of shutdown. The control replicates the function of a 51V relay by discriminating between short circuit conditions and shutdown conditions, and shutting down the genset as fast as is necessary on a short circuit condition while operating as long as is possible on an overload condition. Control includes algorithms to protect alternator from repeated over current conditions over a short time.

High AC voltage shutdown (59) - Output voltage on any phase exceeds preset values. Time to trip is inversely proportional to amount above threshold. Values adjustable from 105-125% of nominal voltage, with time delay adjustable from 0.25-10 seconds. Default value is 110% for 10 seconds.

Low AC voltage shutdown (27) - Voltage on any phase has dropped below a preset value. Adjustable over a range of 50-95% of reference voltage, time delay 2-10 seconds. Default value is 85% for 10 seconds. Function tracks reference voltage. Control does not nuisance trip when voltage varies due to the control directing voltage to drop, such as during a voltage roll-off during synchronizing.

Under frequency shutdown (81u) - Generator set output frequency cannot be maintained. Settings are adjustable from 0-10 Hz below nominal governor set point, for a 0-20 second time delay. Default: 6 Hz, 10 seconds. Under frequency protection is disabled when excitation is switched off (such as when engine is operating in idle speed mode or the synchronizer is enabled).

Over frequency shutdown/warning (81o) - Generator set is operating at a potentially damaging frequency level. Defaults: Disabled.

Over load (kW) warning - Provides a warning indication when engine is operating at a load level over a set point. Adjustment range: 80-140% of rated kW, 0-120 second delay. Defaults: 105%, 60 seconds.

Reverse power shutdown (32) - Adjustment range: 5-20% of standby kW rating, delay 1-15 seconds. Defaults: 10%, 3 seconds.

Sync check (25) - Verifies that the generator set is operating in synchronism with the system bus prior to allowing the paralleling breaker to close. Includes dead bus sensing capability.

Fail to synchronize warning or shutdown - Indicates that the generator set could not be brought to synchronization with the system bus. Configurable for warning or shutdown and adjustable for time delay of 10-120 seconds. Default is 120 seconds.

Phase sequence sensing shutdown - Verifies that the generator set phase sequence matches the bus prior to allowing the paralleling breaker to close. The generator set will shutdown if the generator set and bus phase sequence do not match.

Reverse Var shutdown - Shutdown level is adjustable: 15-50% of rated Var output, delay 10-60 seconds. Defaults: 20%, 10 seconds.

High alternator temperature (option).

Engine protection

Over speed shutdown - Default setting is 115% of nominal.

Low lube oil pressure shutdown - Level is preset to match the capabilities of each engine. Control includes time delays to prevent nuisance shutdown signals.

Low lube oil pressure warning - Level is preset to match the capabilities of each engine. Control includes time delays to prevent nuisance shutdown signals.

High coolant temperature shutdown.

High coolant temperature warning.

Low coolant pressure warning/shutdown.

Low coolant level warning/shutdown.

Low coolant temperature warning - Indicates that engine temperature may not be high enough for a 10 second start or proper load pickup.

Low and high battery voltage warning - Indicates battery charging system failure by continuously monitoring battery voltage and indicating a problem when voltage is outside a preset acceptance band.

Discharged battery protection - When DC voltage is below a preset threshold, the control will shut down to avoid completely discharging the battery.

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Weak battery warning - The control system will test the battery bank each time the generator set is signaled to start and indicate a warning if the generator set battery indicates impending failure.

Fail to start (overcrank) shutdown.

Fail to crank shutdown - Control has signaled starter to crank engine but engine does not rotate.

Redundant starter disconnect.

Redundant speed sensors - Loss of one sensor results in a mag pickup sensor warning. Loss of both sensors results in mag pickup failure.

Low fuel day tank and low fuel main tank warning.

Cranking lockout - The control will not allow the starter to attempt to engage or to crank the engine when the engine is rotating.

Sensor failure indication - All analog sensors are provided with sensor failure logic to indicate if the sensor or interconnecting wiring has failed. Separate indication is provided for fail high or low.

High crankcase blowby level warning.

High fuel temperature warning.

High intake manifold temperature/pressure.

Aftercooler cooler inlet over temperature.

Paralleling functions (optional)

First Start Sensor™ System - PowerCommand provides a unique control function that positively prevents multiple generator sets from simultaneously closing to an isolated bus under black start conditions. The First Start Sensor system is a communication system between generator sets that allows the generator sets to work together to determine which generator set in a system should be the first to close to the bus. The system includes an independent backup function, so that if the primary system is disabled the required functions are still performed.

Synchronizer - PowerCommand incorporates a digital synchronizing function to force the generator set to match the phase relationship and voltage of the generator set output with the system bus or utility grid. The synchronizer includes provisions to provide proper operation even with highly distorted bus voltage waveforms. The synchronizer includes adjustments for phase angle window (5°-20°) and time delay (0.5-5 seconds). The synchronizer is 3-phase sensing, and includes controls to directly operate a paralleling breaker. The breaker controls include fail to open and fail to close protection.

Load sharing controls - The generator set control includes an integrated load sharing control system for both real (kW) and reactive (kVar) loads when the generator set(s) are operating on an isolated bus. The control system determines kW load on the engine and kVar load on the alternator as a percent of generator set capacity, and then regulates fuel and excitation systems to maintain system and genset at the same percent of load without impacting voltage or frequency regulation. The control can also be configured for operation in droop mode for kW or Kvar load sharing.

Load govern controls - When PowerCommand receives a signal indicating that the generator set is paralleled with an infinite source such as a utility (mains) service, the generator set will operate in load govern mode. In this mode the generator set will synchronize and close to the bus, ramp to a pre-programmed kW and kVar load level, and then operate at that point. Control is adjustable for kW values from 0-100% of standby rating, and 0.7-1.0 power factor (leading). Default setting is 80% of standby and 1.0 power factor. The control includes inputs to allow independent control of kW and kVar load sharing level by a remote device while in the load govern mode. The rate of load increase and decrease is also adjustable in the control.

Load demand control - The control system includes the ability to respond to an external signal to initiate load demand operation. On command, the generator set will ramp to no load, open its paralleling breaker, cool down, and shut down. On removal of the command, the generator set will immediately start, synchronize, connect, and ramp to its share of the total load on the system.

Power transfer control (optional)

The Power transfer control feature allows PowerCommand to provide integrated automatic power transfer functions including source availability sensing and transfer device (circuit breaker) monitoring and control. The control is configurable for open transition, fast transfer (100 mS), or soft (ramping) sequences of operation. Standard functions include:

- 3-phase (line-to-neutral) close differential under voltage sensing for utility (mains) service. Sensing for pickup in an adjustable range from 85-100% of nominal, with default at 95% of dropout setting. Dropout is configurable 75-98% of pickup, with default at 85%.
- 3-phase over voltage sensing for normal utility service adjustable for pickup at 95-105% of dropout and dropout configurable for 105-135% of nominal. Time delay is adjustable in a range of 0.5-120 seconds. Default is disabled and is enabled using InPower.
- Under frequency sensing for normal utility service. Adjustment range is 80-95% of nominal. Default is disabled and is enabled using InPower.
- Configurable sequence of operation with or without adjustable program-transition capability. Adjustment range is 0-60 seconds.
- Remote exercise feature accepts a remote signal to initiate with or without load testing, or testing can be

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initiated by the operator. Test sequence may include a programmed idle period prior to acceleration to rated voltage and frequency, and after cool down. Test may be configured to be performed with load or without load.

- Time delay start and stop as described in this document; time delay transfer adjustable in a range of 0-120 seconds and retransfer in a range of 0-1800 seconds; all in 1-second increments.
- Fail to disconnect timer is adjustable in a range of 0.1 to 120 seconds.

Environment

The control is designed for proper operation without recalibration in ambient temperatures from -40 °C to +70 °C (-40 °F to +158 °F) and for storage from -40 °C to +80 °C (-40 °F to +176 °F). Control will operate with humidity up to 95%, non-condensing and at altitudes up to 5000 m (13,000 ft).

The operator control panel has a single membrane surface which is impervious to the effects of dust, moisture, oil and exhaust fumes. The panel uses sealed membrane or oil-tight switches to provide long reliable service life in harsh environments.

The control system is specifically designed for resistance to RFI/EMI and to resist the effects of vibration to provide a long reliable life when mounted on a generator set. The control includes transient voltage surge suppression to provide compliance to referenced standards.

The control is mounted on a vibration-isolated structure attached to the generator set skid and includes all generator set wiring factory-installed.

Control interface

Input signals to the PowerCommand control include:

Remote start signal - May be connected via either discrete signal or Lon® Network or both for premium reliability. Discrete signal is normally open contact to ground or normally closed contact that opens to indicate start signal. Separate signal inputs available for emergency start and non-emergency start.

Remote emergency stop.

Low main or day tank fuel level warning.

Remote alarm reset.

Load demand stop.

Utility parallel (load govern) mode command.

Configurable customer inputs - Control includes provisions for (4) input signals from customer discrete devices. (16) additional input signals can be implemented with the use of external network modules.

Output signals from the control include:

Generator set running signal - Fused normally open contact rated 5 A at 30 VDC/180 VAC, closes to indicate generator set is running.

Generator set common shutdown signal - Self-protected relay driver.

Load shed signal - Self-protected relay driver. Operation is configurable for under frequency or over kW load or both. Adjustment range is 80-140% of standby rating with time delay of 0-120 seconds. Default settings are overload 105%, 60 sec, and under frequency 3 Hz below governor reference for 3 seconds.

Ready to load signal - Self-protected relay driver. Operates when the generator set has reached 90% of rated speed and voltage and latches until generator set is switched to off or idle mode.

Modem control signal - Self-protected relay driver.

Paralleling breaker interface - Fused normally open relay contact (5 A, 30 VDC/180 VAC) for parallel breaker close signal and normally open contact for parallel breaker open signal.

Control power for auxiliary devices is available from the controller.

Network connections include:

Serial interface - This communication port is to allow the control to communicate with a personal computer running InPower service and maintenance software.

Echelon® LonWorks interface (option) – System allows for fast, effective incorporation of auxiliary I/O, remote annunciation, redundant start commands from Cummins transfer switches, and other control functions.

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Software

InPower - An optional PC-based software service tool that is designed to directly communicate to PowerCommand generator sets and transfer switches to facilitate service and monitoring of these products.

PowerCommand for Windows® - An optional software tool that is used to remotely monitor and control generator sets, transfer switches and other on-site power system devices.

Certifications

PowerCommand meets or exceeds the requirements of the following codes and standards:

NFPA110: For Level 1 systems

UL508: Recognized or Listed and suitable for use on UL 2200 Listed generator sets

CSA C282-M: 1999 compliance

CSA 22.2 No. 14 M91: Industrial Controls

ISO 8528-4: 1993 compliance, Controls and Switchgear

NFPA99: Standard for Health Care Facilities

CE Mark

EN 50081-1: Residential, Commercial, Light Industrial

EN 50081-2: Industrial

EN 50082-1: Residential, Commercial, Light Industrial

EN 50082-2: Industrial

ISO 7637, pulses #2b, 4: DC Supply Surge Voltage Test

Mil Std 202C, Method 101: Salt Fog Test

ANSI C62.41: Surge Withstand

IEC 801.2, 3, 4, 5

ISO9001: PowerCommand control systems and generator sets are designed and manufactured in ISO9001 certified facilities.

Warranty

PowerCommand control systems are a part of complete power systems provided by Cummins Power Generation and are covered by a one year limited warranty as a standard feature.

Extended warranty options are available for coverage up to 10 years.

Options and accessories

- ☑ Isolated bus paralleling. Provides all automatic and manual paralleling functions for systems that operate isolated from the utility service.
- ☐ Full function paralleling. Provides all paralleling functions, including automatic and manual operation, protection, and other features described in this document.
- ☐ Open transition power transfer control. Control will operate two circuit breakers to provide power transfer between a normal source and a generator in a “break before make” sequence.
- ☐ Fast closed transition power transfer control. Control will operate two circuit breakers to provide power transfer between a normal source and generator in a “make before break” sequence between live sources, and “break before make” from a failed source. Overlap between sources is 100 mS or less.
- ☐ Closed transition (ramping) power transfer control. Control will operate two circuit breakers to provide power transfer between a normal source and generator in a “make before break” sequence between live sources, and “break before make” from a failed source. Overlap time between sources is configurable, and control ramps load from source to source to minimize disturbances on transfer.
- ☐ Key-type mode select switch.
- ☐ Ground fault alarm module.
- ☐ Exhaust temperature monitoring.
- ☐ Alternator temperature monitoring.
- ☑ Network Interface Module
- ☑ Digital remote annunciator. (See S-1343)
- ☐ Digital output relay module (See S-1431)
- ☐ Modbus® interface. (See S-1471)
- ☐ Cummins Power Generation iWatch™ remote monitoring system (S-1518)
- ☐ Cummins Power Generation iWatch Wireless™ remote monitoring system (S-1572)
- ☐ ILSI (isochronous load sharing interface). Allows PowerCommand to share real load with other load sharing systems that incorporate analog load sharing lines. See document C604 for more information.
- ☐ Utility protective relaying. Gensets can be provided with power switching mechanisms and utility grade protective relaying to meet local grid protection requirements.

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See your distributor for more information

Cummins Power Generation

Americas
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574 5000
Fax: 763 574 5298

Europe, CIS, Middle East and Africa
Manston Park Columbus Ave.
Manston Ramsgate
Kent CT 12 5BF United Kingdom
Phone 44 1843 255000
Fax 44 1843 255902

Asia Pacific
10 Toh Guan Road #07-01
TT International Tradepark
Singapore 608838
Phone 65 6417 2388
Fax 65 6417 2399

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building electrical except through an approved device or after building main breaker is open.

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Prototype Test Supported Emergency/Standby Generator Sets Certification

Cummins Power Generation certifies that its commercial generator sets bearing the Prototype Test Supported (PTS) seal have been subjected to a design and development process that includes extensive prototype testing and evaluation. A PTS production model is engineered and manufactured according to documentation developed through comprehensive research, design and design verification.

Design verification is based on tests of preproduction prototype models manufactured specifically for prototype test purposes and not sold as new equipment. To be certified as a PTS model, the generator set must satisfy these prerequisites:

DESIGN - The PTS certified generator set must be designed specifically for emergency/standby applications that require high reliability and rapid response.

PROTOYPE TESTING - Design suitability of the PTS certified generator set must be proven by tests on preproduction prototype models. The prototype test program is intended to:

1. Confirm the engine and generator have reserve capacity beyond rating to minimize the potential of damage or shutdown during steady state or transient loading conditions, including momentary overloads.

2. Demonstrate generator set, controls and accessories capability to perform reliably and compatibly in service during disturbances common in actual load circuits.

3. Verify the integrity of the generator and excitation system insulation systems and electrical components to withstand heating under rated load and transient overcurrent conditions.

4. Evaluate generator set mechanical and electrical strength to perform without damage during abnormal operating conditions, such as short circuits or out-of-phase paralleling. While operating at rated load, the generator set must be subjected to several 3-phase short circuits of 20 second duration. After the tests, the generator set is inspected to verify that no electrical or mechanical damage was incurred by any components.

5. Determine by endurance testing that no resonance conditions exist in the generator set or accessories that will cause premature failure of components on production units.

6. Investigate and identify failure modes to minimize the risk of any single component failure or human error that could lead to lack of essential electrical supply.

7. Provide a margin of safety, by actual trials, between the generator set component design and protection systems so that the components are not damaged before the protective devices activate a shutdown.

DOCUMENTATION AND SOFTWARE - The PTS certified generator set must be documented in a single drawing package with all components identified with Cummins Power Generation part numbers. A PTS test certificate must be created for each PTS generator set certifying the PTS testing performed.

QUALITY ASSURANCE - Engineering drawings, specifications and test requirements for a PTS certified generator set must be classified by components and assembly quality characteristics. A component and process inspection and test plan must be developed and maintained to measure product conformance to documentation requirements.

PRODUCTION MODEL TESTING - PTS certified generator sets must be subjected to complete production tests that demonstrate conformance to specifications at all rated conditions, including start-up, full load pickup and a performance run at full rated load and power factor.

PROTOTYPE TEST SUPPORT (PTS)
60 HZ TEST SUMMARY

GENERATOR SET MODELS	REPRESENTATIVE PROTOTYPE
750DQFAA,800DQFAB	Model:1000DQFAD
900DQFAC,1000DQFAD	Alternator: P734C
	Engine: QST30-G5 NR2

The following summarizes prototype testing conducted on the designated representative prototype of the specified models. This testing is conducted to verify the complete generator set electrical and mechanical design integrity. Prototype testing is conducted only on generator sets not sold as new equipment.

Maximum Surge Power: 1055 kW

The generator set was evaluated to determine the stated maximum surge power.

Torsional Analysis and Testing:

The generator set was tested to verify that the design is not subjected to harmful torsional stresses. A spectrum analysis of the transducer output was conducted over the speed range of 1200 to 2000 RPM.

Cooling System: 50 °C Ambient
0.5 in. H2O restriction

The cooling system was tested to determine ambient temperature and static restriction capabilities. The test was performed at full rated load in elevated ambient temperature under stated static restriction conditions.

Electrical and Mechanical Strength:

The generator set was tested to several single phase and three phase faults to verify that the generator can safely withstand the forces associated with short circuit conditions. The generator set was capable of producing full rated output at the conclusion of the testing.

Steady State Performance:

The generator set was tested to verify steady state operating performance was within the specified maximum limits.

Voltage Regulation:	±0.50%
Random Voltage Variation:	±0.50%
Frequency Regulation:	±0.25%
Random Frequency Variation:	±0.25%

Transient Performance:

The generator set was tested with the standard alternator to verify single step loading capability as required by NFPA 110. Voltage and frequency response on load addition or rejection were evaluated. The following results were recorded:

Full Load Acceptance:		
Voltage Dip:	35.5	%
Recovery Time:	4.6	Second
Frequency Dip:	7.3	%
Recovery Time:	5.2	Second
Full Load Rejection:		
Voltage Rise:	16.7	%
Recovery Time:	2.2	Second
Frequency Rise:	3.0	%
Recovery Time:	1.7	Second

Harmonic Analysis:
(per MIL-STD-705B, Method 601.4)

	Line to Line		Line to Neutral	
Harmonic	No Load	Full Load	No Load	Full Load
3	0.052	0.04	0.144	0.092
5	0.128	1.36	0.058	1.32
7	1.0	0.196	1.0	0.19
9	0.012	0.034	0.033	0.066
11	0.985	0.84	1.01	0.83
13	0.158	0.32	0.12	0.29
15	0.0	0.005	0.025	0.022

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ALTERNATOR DATA SHEET

Frame Size: HC6K

CHARACTERISTICS

WEIGHTS:	Wound Stator Assembly	2553	lb	1150	kg
	Rotor Assembly	2426	lb	1093	kg
	Complete Alternator	5162	lb	2325	kg
MAXIMUM SPEED:		2250	rpm		
EXCITATION CURRENT:	Full Load	2.5	Amps		
	No Load	0.5	Amps		
INSULATION SYSTEM:	Class H Throughout				

3 Ø RATINGS (0.8 power factor) (Based on specified temperature rise at 40ºC ambient temperature)		60 Hz				50 Hz		
		110/190* 220/380	120/208* 240/416	139/240* 277/480	347/600	110/190* 220/380	120/208* 240/415	127/220* 254/440
150ºC Rise Ratings	kW	985	1080	1220	1220	944	944	944
	kVA	1231	1350	1525	1525	1180	1180	1180
125ºC Rise Ratings	kW	930	1020	1150	1150	888	888	888
	kVA	1163	1275	1438	1438	1110	1110	1110
105ºC Rise Ratings	kW	865	950	1050	1050	800	800	800
	kVA	1081	1188	1313	1313	1000	1000	1000
80ºC Rise Ratings	kW	750	824	900	900	708	708	708
	kVA	938	1030	1125	1125	885	885	885

REACTANCES (per unit, ±10%) (Based on full load at 125ºC Rise Rating	110/190* 220/380	120/208* 240/416	139/240* 277/480	347/600	110/190* 220/380	120/208* 240/415	127/220* 254/440
Synchronous	3.45	3.15	2.67	2.67	2.77	2.32	2.07
Transient	0.27	0.25	0.21	0.21	0.23	0.20	0.17
Subtransient	0.19	0.18	0.15	0.15	0.17	0.14	0.13
Negative Sequence	0.26	0.24	0.20	0.20	0.22	0.18	0.16
Zero Sequence	0.03	0.03	0.02	0.02	0.03	0.02	0.02

MOTOR STARTING	Broad Range	600	Broad Range
Maximum kVA (90% Sustained Voltage)	4234	4234	2875

TIME CONSTANTS (Sec)	Broad Range	600	Broad Range
Transient	0.185	0.185	0.185
Subtransient	0.025	0.025	0.025
Open circuit	3.400	3.400	3.400
DC	0.049	0.049	0.049

WINDINGS (@ 20ºC)	Broad Range	600	Broad Range
Stator Resistance (Ohms per phase)	0.0038	0.0052	0.0038
Rotor Resistance (Ohms)	1.8900	1.8900	1.8900
Number of Leads	6 (12 Optional)	6	6 (12 optional)

* 12 lead reconnectible option is required to obtain low (parallel wye) voltages.

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Sound Data

1000DQFAD 60Hz

Sound Pressure Levels @ 7 meters dB(A)

Configuration		Position (Note 1)								8 Position Average
		1	2	3	4	5	6	7	8	
Standard-Unhoused (Note 3)	Infinite Exhaust	92.4	93.2	93.1	95.0	90.2	94.0	94.2	94.2	93.5
F200 - Weather	Mounted Muffler	90.4	91.6	82.1	89.9	91.9	88.9	81.8	91.1	89.7
F201 - Quiet Site II First Stage	Mounted Muffler	78.6	78.0	75.8	79.6	84.8	79.6	76.1	77.8	79.8
F202 - Quiet Site II Second Stage	Mounted Muffler	74.4	77.9	77.0	74.7	73.4	73.3	75.7	77.2	75.8

Note:
1. Position 1 faces the engine front at 23 feet (7 m) from the surface of the generator set. The positions proceed around the generator set in a counter-clockwise direction in 45° increments.
2. Data based on full rated load with standard radiator-fan package.
3. Sound data for generator set with infinite exhaust do not include exhaust noise.
4. Sound pressure levels per ANSI S1.13-1971 as applicable.
5. Reference sound pressure is 20 μPa.
6. Sound pressure levels are subject to instrumentation, measurement, installation and generator set variability.
7. Sound data with remote-cooled sets are based on rated loads without fan noise.

Sound Power Levels dB(A)

Configuration		Octave Band Center Frequency (Hz)								Sound Power Level
		63	125	250	500	1000	2000	4000	8000	
Standard-Unhoused (Note 3)	Infinite Exhaust	88.7	103.6	107.5	113.5	115.3	114.1	111.6	110.0	120.6
F200 - Weather	Mounted Muffler	90.6	100.7	105.2	111.4	112.2	110.5	106.2	103.3	117.2
F201 - Quiet Site II First Stage	Mounted Muffler	90.3	98.5	100.9	104.3	104.5	102.8	100.6	96.5	110.5
F202 - Quiet Site II Second Stage	Mounted Muffler	90.7	98.0	96.2	95.2	98.8	101.4	101.5	95.4	107.3

Note:
1. Sound pressure levels per ANSI S12.34-1988 and SIO 3744 as applicable.
2. Data based on full rated load with standard radiator-fan package.
3. Sound data for generator set with infinite exhaust do not include exhaust noise.
4. Reference sound pressure is 1pW-1x10^{-12} W.
5. Sound pressure levels are subject to instrumentation, measurement, installation and generator set variability.
6. Sound data with remote-cooled sets are based on rated loads without fan noise.

Exhaust Sound Pressure Levels @ 1 meter dB(A)

Open Exhaust (No Muffler) @ Rated Load	Octave Band Center Frequency (Hz)								Sound Pressure Level
	63	125	250	500	1000	2000	4000	8000	
	94.5	111.6	116.5	122.0	122.5	126.5	125.7	121.3	131.4

Note: Sound pressure level per ISO 6798 Annex A as applicable.

EPA Tier 2 Exhaust Emission Compliance Statement 1000DQFAD

60 Hz Diesel Generator Set

Compliance Information:

The engine used in this generator set complies with the Tier 2 emissions limits of U.S EPA New Source Performance Standards for Stationary Emergency engines under the provisions of 40 CFR 60 Subpart IIII when tested per ISO 8178 D2.

Engine Manufacturer:	Cummins Inc
EPA Certificate Number:	CEX-STATCI-11-05
Effective Date:	06/08/2010
Date Issued:	06/08/2010
EPA Diesel Engine Family:	BCEXL030.AAD
CARB Executive Order:	

Engine Information:

Model:	Cummins Inc QST30-G5 NR2	Bore:	5.51 in. (140 mm)
Engine Nameplate HP:	1490		
Type:	4 Cycle, 50°V, 12 Cylinder Diesel	Stroke:	6.5 in. (165 mm)
Aspiration:	Turbocharged and Low Temperature Aftercooled (Air-to-Air)	Displacement:	1860 cu. in. (30.5 liters)
Compression Ratio:	14.7:1		
Emission Control Device:	Turbocharged and Low Temperature Aftercooled(Air-to-Air)		

U.S. Environmental Protection Agency NSPS Stationary Emergency Tier 2 Limits

(All values are Grams per HP-Hour)

COMPONENT	
NOx + HC (Oxides of Nitrogen as NO2 + Non Methane Hydrocarbons)	4.77
CO (Carbon Monoxide)	2.61
PM (Particulate Matter)	0.15

Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.

Enclosures and tanks 250-1000 kW gensets

> Specification sheet

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Enclosure standard features

- 14-gauge steel construction (panels)
- Stainless steel hardware
- Zinc phosphate pretreatment, e-coat primer and super durable powder topcoat paint minimize corrosion and color fade
- Package listed to UL 2200
- Designed to satisfy National Electrical Code installation requirements
- Fuel and electrical stub-up area within enclosure perimeter
- Fixed louvers
- Cambered roof prevents water accumulation
- Recessed, lockable doors in two sides
- Retainers hold doors open for easy access
- Enclosed exhaust silencer ensures safety and protects against rust
- Rain cap
- Exterior oil and coolant drains with interior valves for ease of service
- Rodent barriers on inlet
- Non-hydroscopic sound attenuating material
- Side mounted controls and circuit breakers
- Easy access lifting points for spreader bars
- Dual vibration isolation system (250-500 kW)
- Spring vibration isolation system (600-1000 kW)
- Enclosure mounts to lifting base or fuel tank (250-500 kW)
- Enclosure mounts to lifting base (600-1000 kW)
- Factory pre-assembled package
- Designed for outdoor use only
- Externally mounted emergency stop button for operator safety (optional on 250-500 kW)
- Horizontal air discharge to prevent leaf and snow accumulation (600-1000 kW)

Options

- Three levels of sound attenuation
- Motorized louvers to protect from ice and snow accumulation (available on air inlet for all models and on air outlet on level II, 250-500 kW enclosures only)
- Horizontal air discharge, sound level 2 only (250-500 kW)
- Aluminum construction with roll-coated polymer paint
- Wind rated to 150 mph (aluminum enclosures)
- Neutral sandstone paint color (aluminum only)
- Factory mounted battery charger
- External 120 VAC service outlet
- Rain hoods for air inlet (250-500 kW)
- Lifting base in lieu of a sub-base tank (250-500 kW)
  - Pre-wired AC distribution package
  - 100 amp (250-500 kW) or 150 amp (600-1000 kW) main circuit breaker; connected to 120 VAC line-neutral and 208 or 240 VAC line-line, spare breaker positions and capacity for future upgrades (600-1000 kW)
  - GFCI protected internal 120 VAC service receptacle
  - GFCI protected weather proof external 120 volt service receptacle
  - All factory installed AC powered features pre-wired into load center
- Interior lights – 120 volt (600-1000 kW)
- Rain hoods for air inlet (250-500 kW)
- Seismic isolators available (600-1000 kW)

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S-1443v (11/09)

Fuel tanks

Standard sub-base tank features

- UL 142 Listed
- ULC-S601-07 Listed
- NFPA37 compliant
- Dual walled, steel construction
- Emergency tank and rupture basin vents
- Tank mounted mechanical fuel gauge
- Fuel supply and return tubes
- Top mounted leak detection float switch
- Low and high level fuel switches
- Mounting brackets for optional pump and control (250-500 kW)
- Integral lifting points
- Basin drain

Sub-base tank options

- Pre-wired fuel pump and control
- Fuel overfill alarm – internal or external
- Overflow and tank fill plugs
- Five gallon spill fill box – internal or external
- Fill pipe extender
- Local code approvals available

250-500 kW dual wall sub-base fuel tanks – usable operating hours

Genset model	Gallons/hour at full load	300 gallon tank	400 gallon tank	500 gallon tank	600 gallon tank	660 gallon tank	720 gallon tank	850 gallon tank	1470 gallon tank	1700 gallon tank
250 DQDAA	19.4	15	21	26	31	34	37	–	76	–
275 DQDAB	19.8	15	20	25	30	33	36	–	74	–
275 DQHAA	21.81	13	18	23	27	30	–	39	–	78
300 DFCB	22.5	13	18	22	27	29	32	–	65	–
300 DQDAC	21.8	14	18	23	28	30	33	–	67	–
300 DQHAB	23.15	13	17	21	26	28	–	36	–	73
350 DFCC	24.4	12	16	20	25	27	30	–	60	–
350 DFEG	24.6	12	16	20	24	27	–	35	–	69
400 DFCE	29.1	10	14	17	21	23	25	–	51	–
400 DFEH	27.1	11	15	18	22	24	–	31	–	63
450 DFEC	31	10	13	16	19	21	–	27	–	55
450 DFEJ	30.0	10	13	17	20	22	–	28	–	57
500 DFED	34	9	12	15	18	19	–	25	–	50
500 DFEK	34.8	9	11	14	17	19	–	24	–	49

Operating hours are measured at 60Hz, standby rating.

600-1000 kW dual wall sub-base fuel tanks – usable operating hours

Genset model (60 Hz)	Gallons/hour at full load	200 gallon tank	660 gallon tank	1000 gallon tank	1500 gallon tank	2000 gallon tank	2400 gallon tank	3000* gallon tank
600 DFGB	44.2	5	15	23	34	45	54	68
600 DQCA	41.8	5	16	24	36	48	57	72
750 DFGE	58.5	3	11	17	26	34	41	51
750 DFHA	54.7	4	12	18	27	37	44	55
750 DQCB	51.9	4	13	19	29	39	46	58
750 DQFAA	52.7	4	13	19	28	38	46	57
800 DFHB	57.8	3	11	17	26	35	42	52
800 DQCC	56.1	4	12	18	27	36	43	53
800 DQFAB	56.4	4	12	18	27	35	43	53
900 DFHC	60.2	3	11	17	25	33	40	50
900 DQFAC	63.9	3	10	16	23	31	38	47
1000 DFHD	69.3	3	10	14	22	29	35	43
1000 DQFAD	72.2	3	9	14	21	28	33	42

*3000 gallon tank offered as an accessory kit

- Operating hours are measured at 60Hz, standby rating.
- Up to 90% fill alarm to comply with NFPA30, operating capacity is reduced by 10%.

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Enclosure package sound pressure levels @ 7 meters dB(A)

Genset model	Weather protective enclosure (F200, F203)	QuietSite Level 1 sound attenuated enclosure (F201, F204)	QuietSite Level 2 sound attenuated enclosure (F202, F205)
250 DQDAA	90	86	71
275 DQDAB	89	86	71
275 DQHAA	86	85	74
300 DFCB	86	84	71
300 DQDAC	89	86	71
300 DQHAB	89	88	76
350 DFCC	87	85	72
350 DFEG	85	83	72
400 DFCE	89	85	73
400 DFEH	89	85	73
450 DFEC	89	85	75
450 DFEJ	87	84	74
500 DFED	90	86	76
500 DFEK	88	85	73
600 DFGB	85	78	74
600 DQCA	87	79	74
750 DFGE	87	80	75
750 DFHA	91	81	77
750 DQCB	87	79	74
750 DQFAA	89	79	75
800 DFHB	91	81	77
800 DQCC	87	79	74
800 DQFAB	89	79	75
900 DFHC	93	83	78
900 DQFAC	89	80	76
1000 DFHD	90	80	76
1000 DQFAD	90	80	76

- All data is 60Hz, full load standby rating, steel enclosures only.
- Data is a measured average of 8 positions.

250-1000 kW
Weather protective

250-1000 kW
QuietSite Level 2

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Cummins® Power Generation

Package dimensions of enclosure, exhaust system, and UL tank

250-500 kW

Tank size (gal)	Weather protective package length (in)	QuietSite level I package length (in)	QuietSite level 2 package length (in)	Width (in)	Height (in)	Weather protective package weight (lbs)	QuietSite level 1 package weight (lbs)	QuietSite level 2 package weight (lbs)
300	188	188	222	82	104	5235	5660	6578
400	188	188	222	82	106	5420	5845	6763
500	188	188	222	82	108	5522	5947	6865
600	188	188	222	82	111	5676	6101	7019
660	188	188	222	82	113	5753	6178	7096
720	188	188	222	82	114	5885	6310	7228
850	188	188	222	82	118	6065	6490	7408
1470	200	200	200	82	128	6891	7316	8234
1700	234	234	234	82	128	7466	7891	8809
Lifting base	188	188	222	82	100	4110	4535	5453

600-1000 kW

Tank size (gal)	Weather Protective Package Length (in)	QuietSite Level I Package Length (in)	QuietSite Level 2 Package Length (in)	Width (in)	Height (in)	Weather Protective Package Weight (lbs)	QuietSite Level 1 Package Weight (lbs)	QuietSite Level 2 Package Weight (lbs)
~~**200**~~	~~260~~	~~303~~	~~315~~	~~98~~	~~133~~	~~8731~~	~~11611~~	~~13491~~
~~**660**~~	~~260~~	~~303~~	~~315~~	~~98~~	~~133~~	~~9479~~	~~12359~~	~~14239~~
~~**1000**~~	~~260~~	~~303~~	~~315~~	~~98~~	~~137~~	~~9825~~	~~12705~~	~~14585~~
~~**1500**~~	~~260~~	~~303~~	~~315~~	~~98~~	~~142~~	~~10328~~	~~13208~~	~~15088~~
2000	~~280~~	~~320~~	320	98	142	~~11823~~	~~14703~~	16583
~~**2400**~~	~~332*~~	~~330~~	~~332~~	~~98~~	~~142~~	~~12810~~	~~15690~~	~~17570~~

- This weight does not include the generator set. Consult your local Cummins Power Generation distributor or the appropriate generator specification sheet.
- Width is 86” lifting eye to lifting eye (250-500 kW), 102” lifting eye to lifting eye (600-1000 kW).
- Height - Florida, Michigan, and Suffolk add 4” (250-500 kW) or 2” (600-1000 kW) for bottom space.
- Maximum length emergency vent removed.

CSA - The generator set is CSA certified to product class 4215-01.

UL - The generator set is available Listed to UL 2200, Stationary Engine Generator Assemblies. The PowerCommand control is Listed to UL 508 - Category NITW7 for U.S. and Canadian usage.

See your distributor for more information

Americas
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574-5000
Fax: 763 574-5298

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Power Generation

Ground fault indication relay - H550, H666, H667, H668

> Specification sheet

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Code requirements

NFPA 70, the U.S. National Electrical Code (NEC) requires that services of 1000 amps and larger in capacity which operate at more than 150 volts from line-to-neutral must be provided with ground fault equipment. Generator sets rated at 1000 amps and larger which serve as emergency power must be provided with ground fault indication equipment. Health care facilities that utilize ground fault protection equipment must be provided with a coordinated multi-level ground fault system.

Cummins Power Generation ground fault indication equipment is designed for use in emergency/standby power systems, for indication of ground fault conditions during generator set operation.

Features

Suitable for indicating a ground fault condition on a generator set which is either locally or remotely grounded.

Supply voltage - Operates on 24 VDC (nominal) control power - fully functional at voltages from 18-30 VDC.

Direct connection - Suitable for direct connection to generator sets operating at voltages up to 600 VAC (line to line).

Ground fault current settings - 100-1200 A, in 10 discrete settings: 100, 150, 200, 250, 300, 450, 600, 750, 800, 1200 A.

Monitoring - Provides continuous monitoring of neutral-to-ground with LED indication for open connection.

Factory mounted controls - Available factory-mounted and interconnected to Cummins Power Generation Detector™ series PowerCommand® controls.

Link reconnection - For use with either 3-pole (solid neutral) or 4-pole (switched neutral) transfer switches.

Indicating lamps - For Relay on (green), ground fault current over setting (red), loss of ground connection (red).

Time delay settings – Adjustable 0-10 seconds.

Circuit board - One-piece molded case fully potted.

Contacts - One set of form C output, 8A at 250 VAC, 8A at 30 VDC.

“Test” - Push-button.

“Reset” - Push-button.

Percent full scale metering output - 0-1 mA full scale.

Bonding jumper - Sized per NEC requirements.

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Construction

The relay is provided in a non-conducting phenolic case, with provisions for panel mounting or mounting to a standard DIN rail (panel mounting is recommended for mounting on a generator set). Relay components are fully potted with epoxy resin for vibration resistance and durability.

The relay includes an integral terminal block assembly, which accepts wires up to 12-gauge.

Relay function selection link (auto/hand reset).

Environmental range - Operating -10 °C to +60 °C, storage -20 °C to 70 °C.

DC supply burden – 2.5 W.

Transfer switch type selection link - (3-pole or 4-pole).

System operation

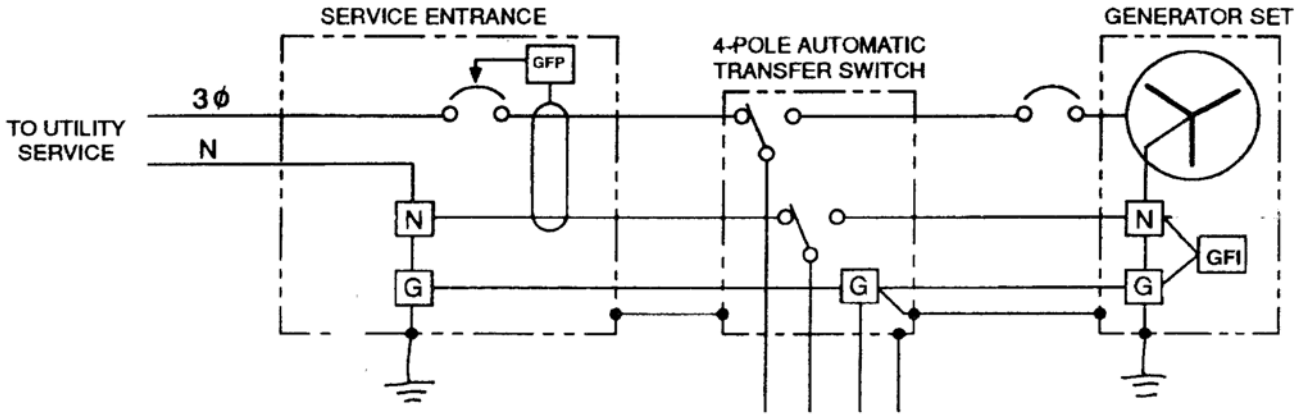
The ground fault relay continuously monitors the voltage across the neutral-to-ground bonding jumper and lights the ground fault alarm lamp on the generator set control when the connection is broken.

When the generator set is running, the relay continuously monitors the neutral-to-ground generator set connection and lights the ground fault alarm lamp on the generator set control when a ground fault condition is sensed.

Alarm condition can be cleared by pushing the reset switch on the generator set control panel. Actual ground fault current level can be monitored with a 0-1 mA meter, directly from the relay. A push button test switch is provided to simulate ground fault conditions and operate the relay and indication circuitry. Addition of the auto-reset link activates automatic reset of the relay after the ground fault condition has cleared.

System schematic

Separately derived system connections (local grounding connection).



Neutral-to-ground bonding jumper must be sized per code requirements. For non-separately derived systems (3-phase/4-wire systems with 3-pole transfer switch), the ground connection and the neutral-to-ground bonding jumper on the generator set are removed, and the 3-pole ATS link is added to the ground fault relay. For non-separately derived systems a label must be applied to the service entrance switchboard, indicating that removal of the equipment-bonding jumper can cause hazardous operating conditions.

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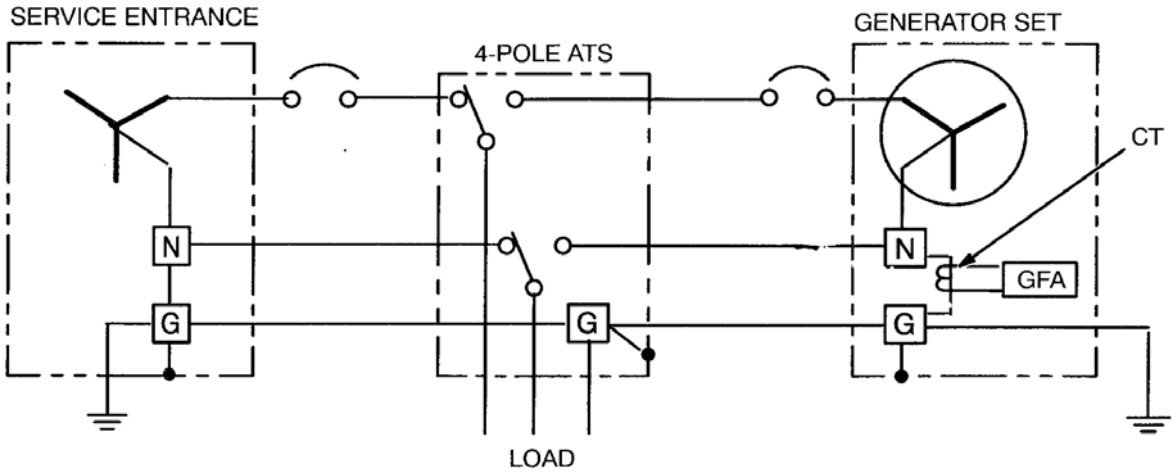
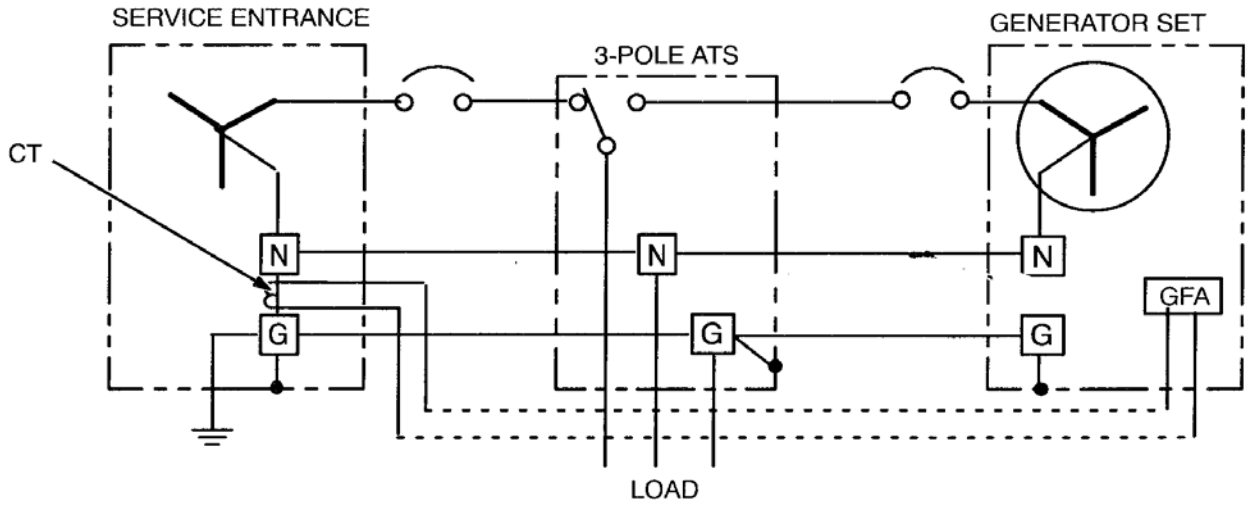
0179-3509 – TYPE A



THREE-PHASE, FOUR-WIRE UTILITY, 4-POLE ATS

0179-3509 – TYPE B



THREE-PHASE, FOUR-WIRE UTILITY, 3-POLE ATS

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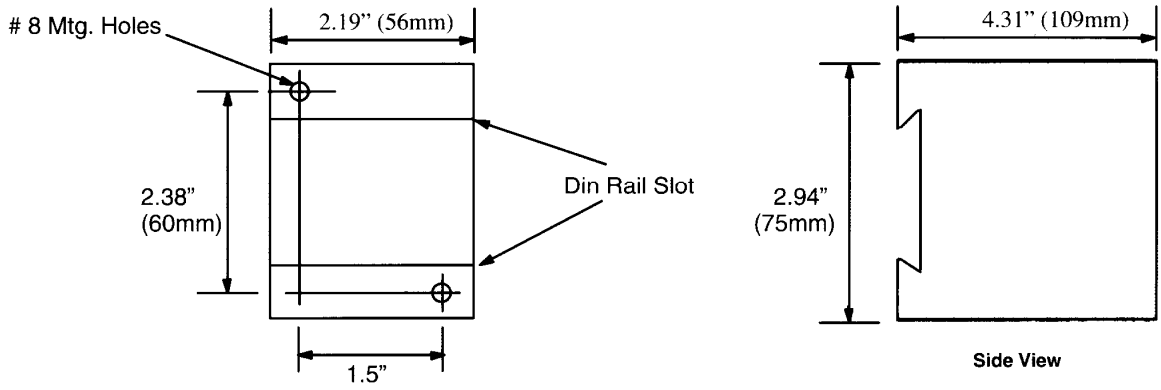
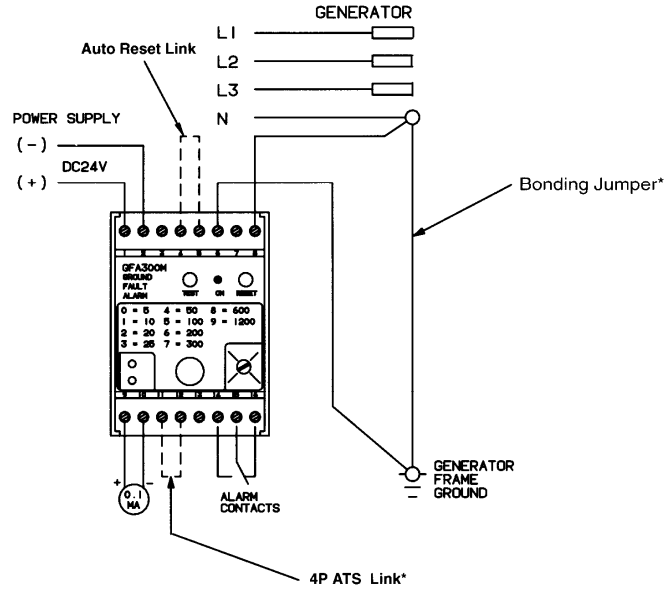
Outline detail



Weight: 19 oz (540 grams)

Interconnection detail



* Required only with separately derived systems. Bonding jumper is included in kit.

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Field installation kits

Accessory Kit #	Corresponding Production Part #	Critical Component	Used with Alt frame size 4 or 5	Used with Alt frame size 6 or 7	Feature Code	Miscellaneous	Instruction Sheet
0179-3244-05	0179-3244-03	0307-3003-01	X		H550	For use with PCC2100	C645
0179-3244-06	0179-3244-07	0307-3003-01		X	H550	For use with PCC2100	C645
0179-3244-09	0179-3244-08	0307-3003-01	X			For use with PCC2100	C645
0179-3428-02	0179-3428-01	0307-3003-01	X		H550	For use with PCC3200, PCC3201	C706
0179-3509-03	0179-3509-01	0307-3003-01		X	H667/H668	Ground Fault Kit – PCC2100/3100, 4-pole. Separately derived transfer switch (SDTS). Installation onto generator set equipped with or without set mounted circuit breaker box.	C656
0179-3509-04	0179-3509-02	0307-3003-01		X	H666	Ground Fault Kit – PCC3200, 4-pole NSDTS (H666) NON-separately derived transfer switch (NSDTS). Installation onto generator set equipped with or without set mounted circuit breaker box.	C656
0179-3509-07	0179-3509-05	0307-3003-01		X	H667/H668	Ground Fault Kit – PCC3200, 4-pole. Separately derived transfer switch (SDTS). Installation onto generator set equipped with or without set mounted circuit breaker box.	C656
0179-3509-08	0179-3509-06	0307-3003-01		X	H666	Ground Fault Kit – PCC3200, 3-pole. NON-separately derived transfer switch (NSDTS). Installation onto generator set equipped with or without set mounted circuit breaker box.	C656
0300-4582-05	0300-4582-03	0307-3003-01	X		H550	For use with PCC3100	C646

Feature descriptions

H550-2 = The unit is equipped with an adjustable sensor to detect a ground fault condition on the main alternator output. A fault condition illuminates an indicating lamp on the genset control panel. Sensor features include: -0 to 1.0 second adjustable time delay. Ground fault pickup settings: 100, 150, 200, 250, 300, 450, 600, 750, 800, 1200 Amps – "Test" and "Reset" buttons and functional condition indicating lights. Suitable for operating voltages up to 600 VAC.

H666-2-2 = The generator set is equipped with a current transformer and a ground fault indication relay for use with a 3-pole, non-sepaately derived transfer switch only, with or without a set mounted circuit breaker. The current transformer will be shopped loose and must be installed at the customer service entrance ground bond connection. Wiring from the current transformer must be brought back to set mounted relay. Other components included with this feature includea set mounted ground fault indication relay. The current transformer has a 4.25 inch round window.

H667-2-2 = The generator set is equipped with a current transformer and ground fault indication relay for use with a 4-pole, separately derived transfer switch and set mounted circuit breaker. The CT is mounted in the circuit breaker box mounted on the left side of the genset as viewed from the generator end. The genset neutral and ground are bonded.

H668-2-2 = The generator set is equipped with a current transformer and ground fault indication relay for use with a 4-pole, separately derived transfer switch and set mounted circuit breaker. The CT is mounted in the circuit breaker box mounted on the right side of the genset as viewed from the generator end. The genset neurtral and ground are bonded.

Certification

ISO9001 - This product was designed and manufactured in facilities certified to ISO9001.

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Americas
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574 5000
Fax: 763 574 5298

Europe, CIS, Middle East and Africa
Manston Park Columbus Ave.
Manston Ramsgate
Kent CT 12 5BF United Kingdom
Phone 44 1843 255000
Fax 44 1843 255902

Asia Pacific
10 Toh Guan Road #07-01
TT International Tradepark
Singapore 608838
Phone 65 6417 2388
Fax 65 6417 2399

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect generator sets to any building electrical system except through an approved device or after building main switch is open.

Warning: For professional use only. Must be installed by a qualified service technician. Improper installation presents hazards of electrical shock and improper operation, resulting in severe personal injury and/or property damage.

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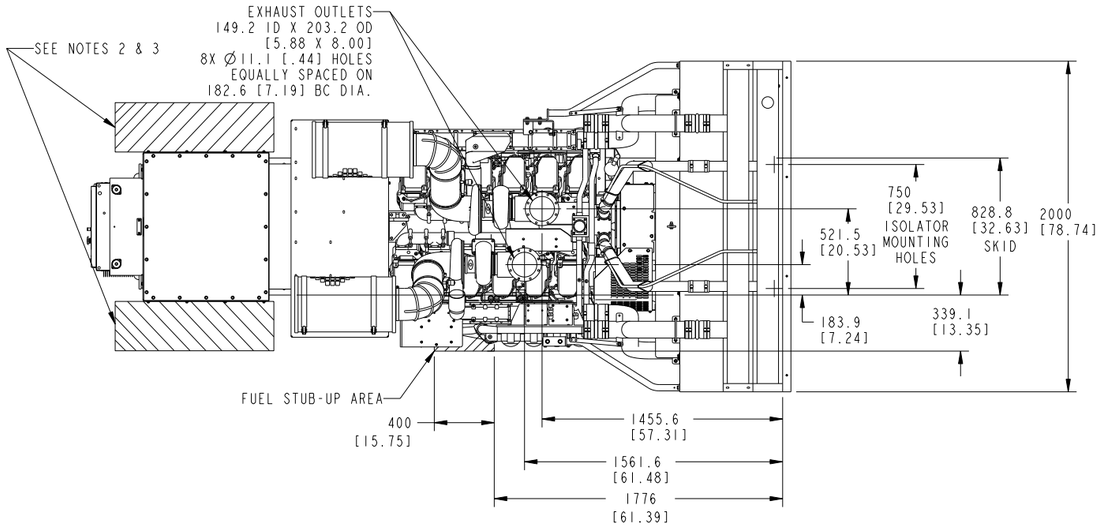
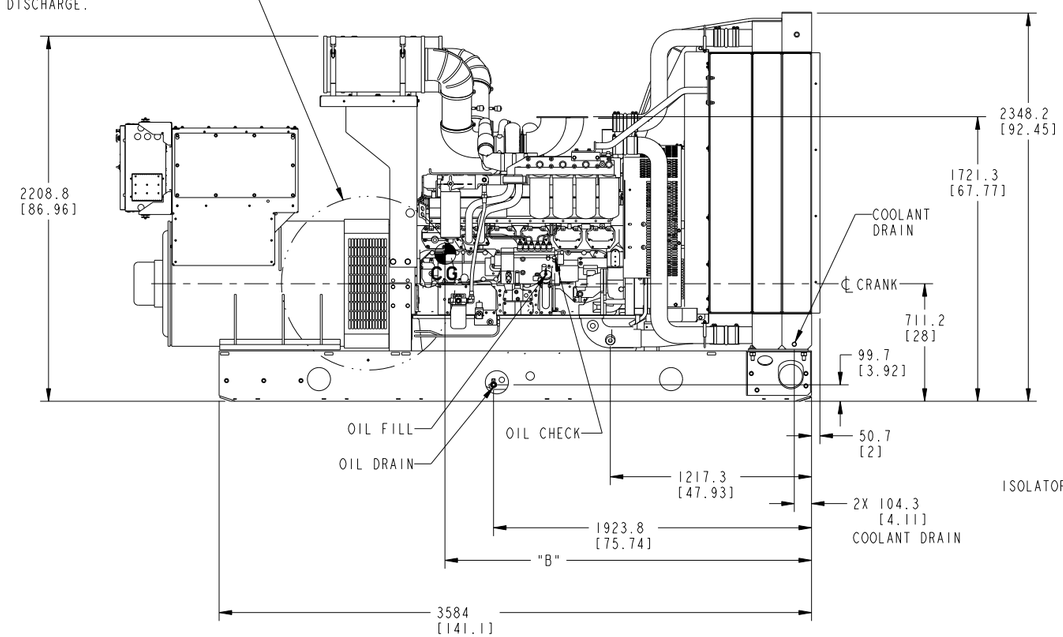
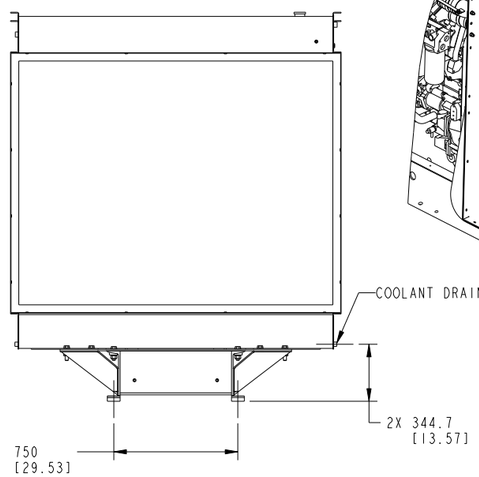
REL NO	LTR	NO	REVISION	ZONE	DWN	CKD	APVD	DATE
ECO-103169	E	1	SEE SHEET 2	-	RJP	VO	PV	06JAN09

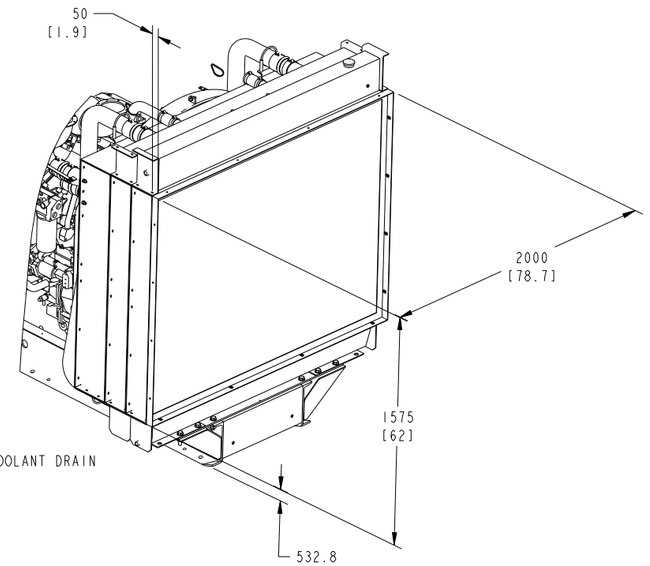


NOTES:

1. DIMENSIONS SHOWN IN [ ] ARE INCHES.
2. REFER TO CIRCUIT BREAKER OUTLINE DRAWING FOR ELECTRICAL STUB-UP AREA FOR SPECIFIC BREAKERS.
3. FOR ENTRANCE BOX APPLICATIONS, SEE APPLICABLE ENTRANCE BOX OUTLINE DRAWING.







QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE
X	± 1	0.00- 4.99 +0.15/-0.08
.X	± 0.8	5.00- 9.99 +0.20/-0.10
.XX	± 0.38	10.00-17.49 +0.25/-0.13
		17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 1/16

SIM TO 0500_3636
DO NOT SCALE PRINT

- CONFIDENTIAL -
PROPERTY OF CUMMINS POWER GENERATION GROUP

DWN	S_JOHNSON
CKD	E_NORDSTROM
APVD	E_NORDSTROM
DATE	10-06-05
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994	
FIRST USED ON	DQFAD
SITE CODE	PGF

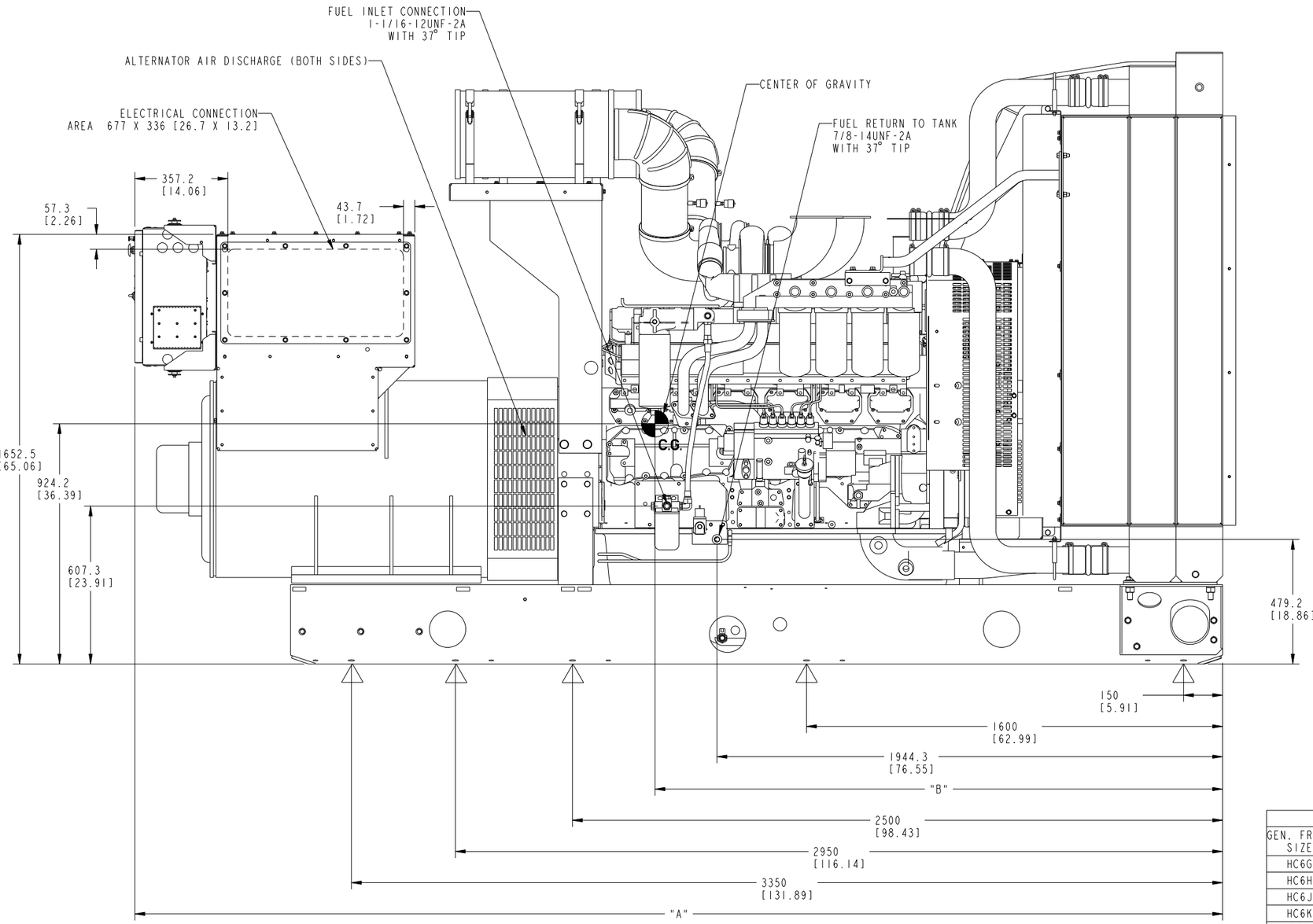
CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

GENSET OUTLINE

DWG SIZE D | 0500_4391 | SHEET 1 of 4 | DWG REV D

Pro/ENGINEER

REL NO	LTR	NO	REVISION	ZONE	DWN	CKD	APVD	DATE
ECO-103169	E	1	ADDED DIM 924.2	6C	RJP	VO	PV	06JAN09



NOTES:

1. DIMENSIONS SHOWN IN [ ] ARE INCHES.
2. 21 [.83] DIA HOLES MARKED BY △ FOR 10 POINT ISOLATION MOUNTING.
3. FUEL IN HOSE [Ø.75] X 2009 [79.1] LONG WITH 3/4-14 NPTF EXTERNAL THREAD FITTING.
   FUEL OUT HOSE [Ø.50] X 1270 [50.0] LONG WITH 3/4-14 NPTF EXTERNAL THREAD FITTING.

TABULATION

GEN. FRAME SIZE	DIM "A"	DIM."B" C.G.	GEN SET DRY WT KGS	GEN SET DRY WT LBS	GEN SET WET WT KGS	GEN SET WET WT LBS
HC6G	4186.2 [164.81]	2022 [79.6]	6433	14183	7048	15539
HC6H	4186.2 [164.81]	2060 [81.1]	6671	14707	7286	16063
HC6J	4186.2 [164.81]	2096 [82.5]	6894	15199	7509	16555
HC6K	4287.8 [168.81]	2108 [83.0]	6969	15364	7584	16720
P7B	4239.5 [166.91]	2192 [86.3]	7373	16254	7670	16910
P7C	4239.5 [166.91]	2210 [87.0]	7631	16824	7929	17480

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM: X ±1 | .X ±0.8 | .XX± 0.38

HOLE: 0.00- 4.99 +0.15/-0.08 | 5.00- 9.99 +0.20/-0.10 | 10.00-17.49 +0.25/-0.13 | 17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 1/8

SIM TO 0500_3636

DO NOT SCALE PRINT

- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP

DRN	S_JOHNSON
CKD	E_NORDSTROM
APVD	E_NORDSTROM
DATE	10-06-05
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994	FIRST USED ON DQFAD

CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

GENSET OUTLINE

SITE CODE PGF

DWG SIZE D | 0500_4391 | SHEET 2 of 4 | DWG REV D

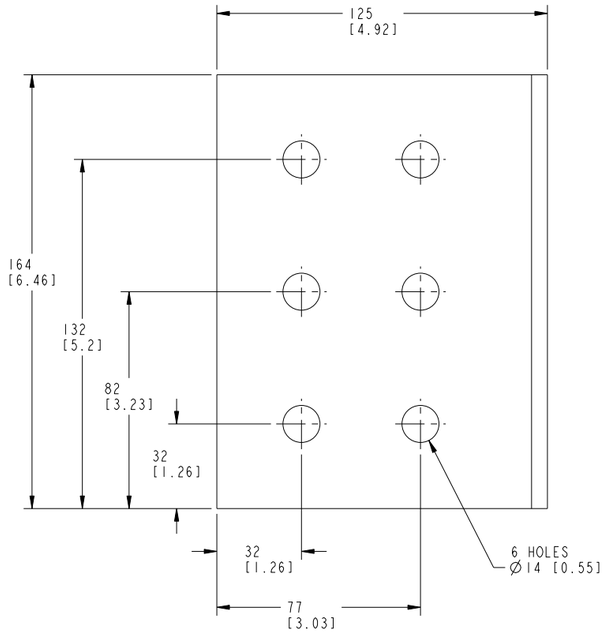
Pro/ENGINEER

REL NO	LTR	NO	REVISION	ZONE	DWN	CKD	APVD	DATE
ECO-103169	E	-	----------	-	RJP	VO	PV	06JAN09

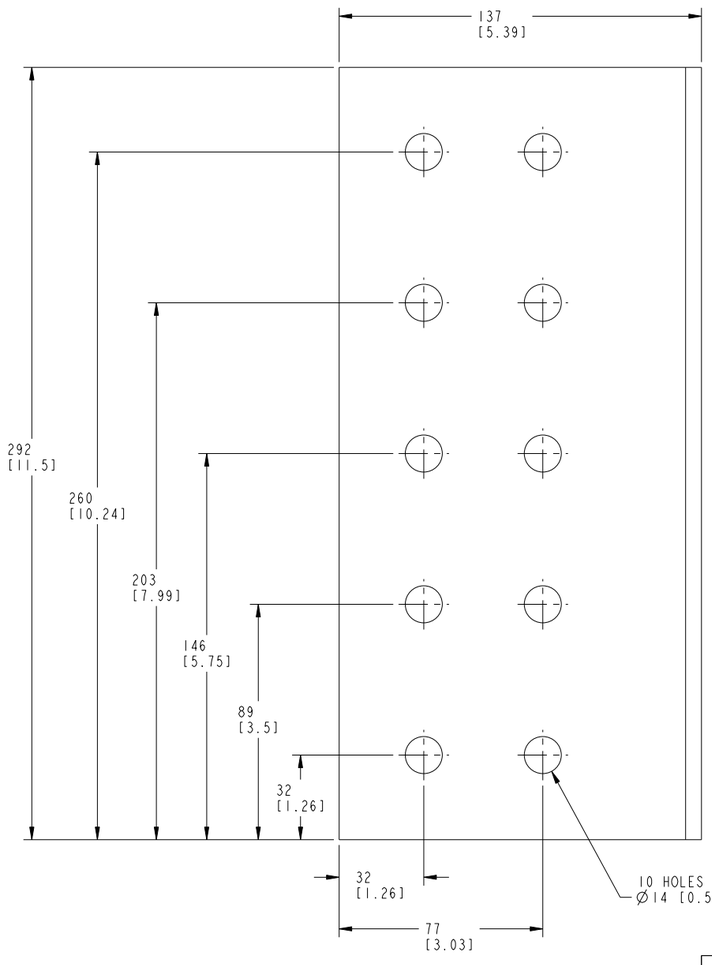
NOTES:

1. TERMINALS WILL ACCOMMODATE STANDARD NEMA AND IEC 2-HOLE LUGS.
2. TERMINALS WILL ACCOMMODATE UP TO 10-750 MCM LUGS.
3. TERMINALS WILL ACCOMMODATE UP TO 6-350 CMC LUGS OR 4-500 MCM LUGS.

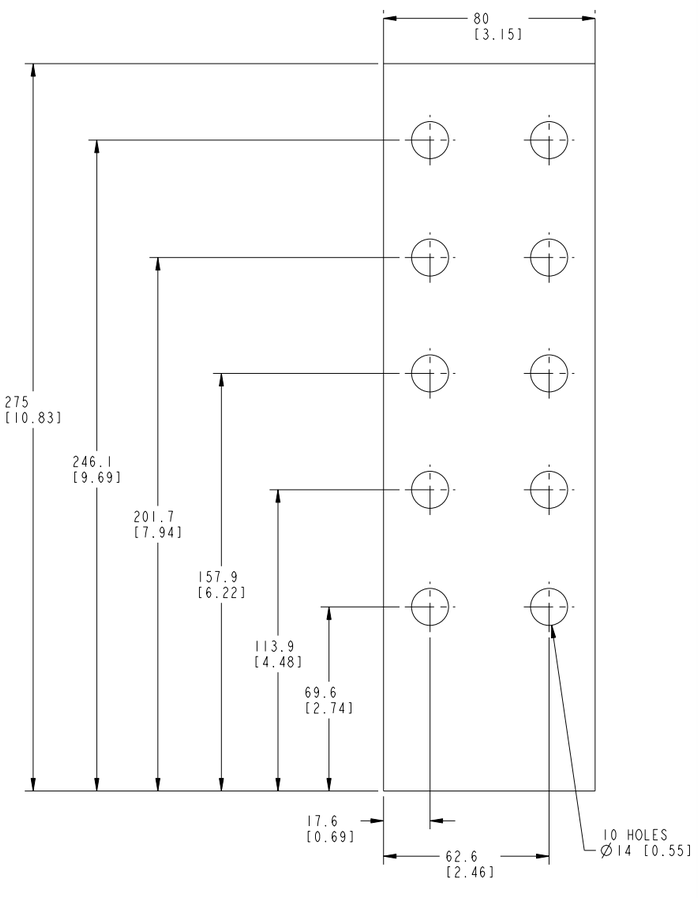
GENERATOR OUTPUT TERMINALS
(FOR NON-RECONNECTABLE HC6 ALTERNATORS)
SEE NOTE 3



GENERATOR OUTPUT TERMINALS
(FOR RECONNECTABLE HC6)
SEE NOTE 2



GENERATOR OUTPUT TERMINALS
(FOR NON-RECONNECTABLE P7)
SEE NOTE 2



QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE
X	± 1	0.00- 4.99 +0.15/-0.08
.X	± 0.8	5.00- 9.99 +0.20/-0.10
.XX	± 0.38	10.00-17.49 +0.25/-0.13
		17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 1/16

SIM TO 0500_3636
DO NOT SCALE PRINT

- CONFIDENTIAL -
PROPERTY OF CUMMINS POWER GENERATION GROUP

DWN S_JOHNSON
CKD E_NORDSTROM
APVD E_NORDSTROM
DATE 10-06-05
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994
FIRST USED ON DQFAD

SITE CODE PGF

CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

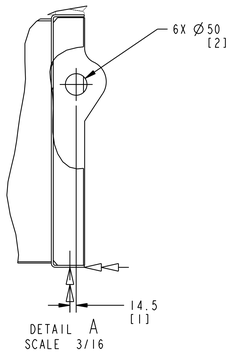
GENSET OUTLINE

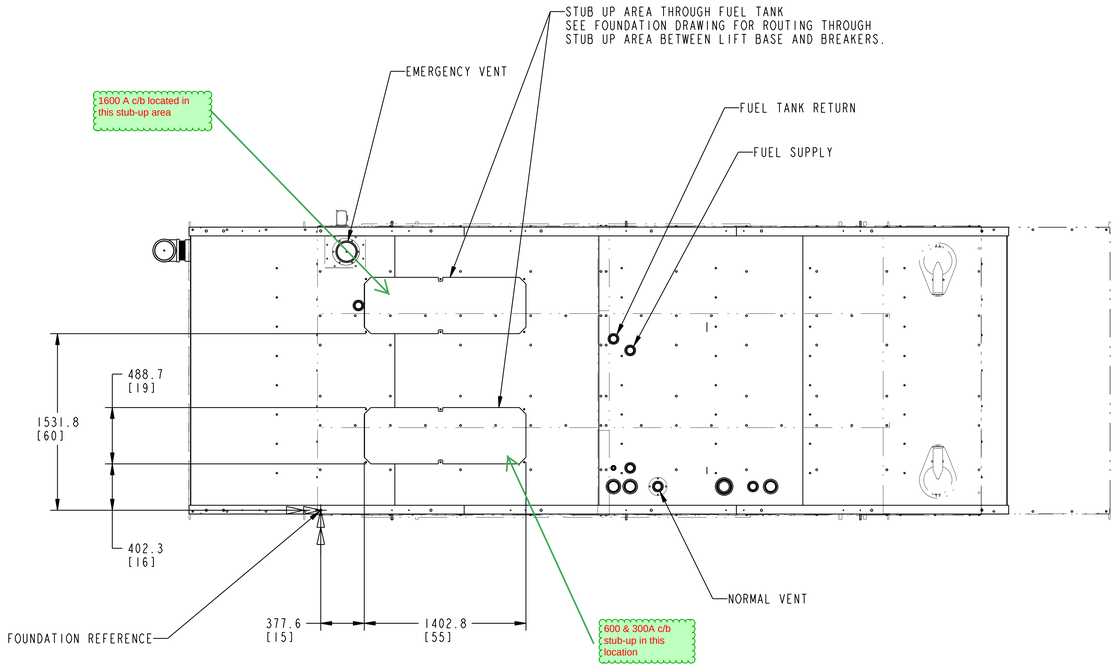
DWG SIZE D | 0500_4391 | SHEET 4 of 4 | DWG REV D

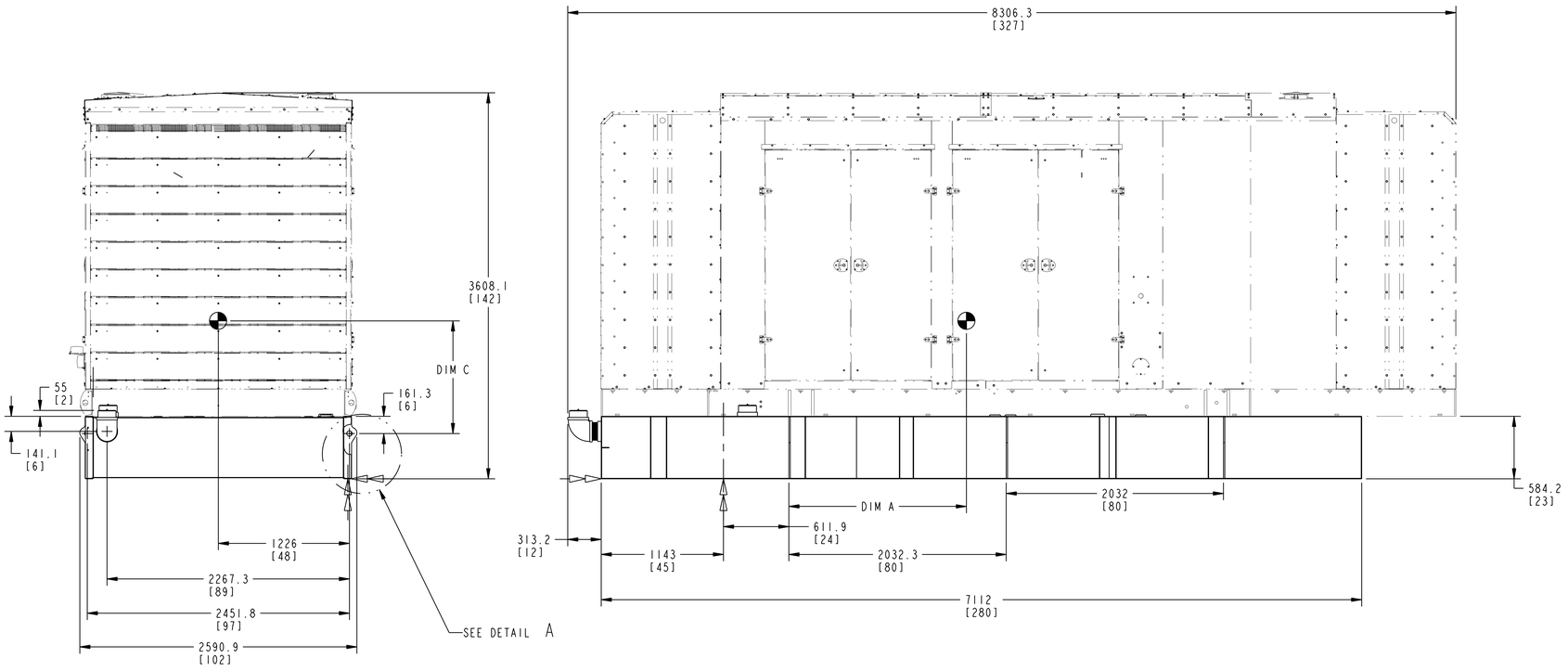
Pro/ENGINEER

REL NO	LTR	NO	REVISION	DWN	CKD	APVD	DATE
ECO-114582	B	1	ADD MODEL DQMAA TO TABULATION	MRJ	ZYM	Z_MOGES	08FEB11

FEATURE CODE C252 WITH F202 OR F205







NOTES:

1. DIMENSION SHOWN IN [ ] ARE IN INCHES.
2. SEE FOUNDATION DRAWING FOR REFERENCE POINT LOCATION (—▷) (SHEET 4).
3. TANK CHANNEL SUPPORT BRACKETS (0319-5654) ARE OPTIONAL. IF CUSTOMER REQUIRES THE BRACKETS THEY ARE SHIPPED SEPERATLY. NOT SHOWN ON DRAWING.

TABULATION

FUEL TANK WITH LEVEL 2 ENCLOSURE FEATURE CODE F202 OR F205

FUEL TANK FEATURE CODE	FUEL TANK SIZE/WEIGHT	MODEL	GENERATOR	WEIGHT KG [LBS]	CG_DIM "A"	CG_DIM "C"
C252	2000 GALLON 2675 [5898]	DQCA,DQCB DQCC	HC6G	14890 [32817]	2166 [85]	968 [38]
			HC6H	15040 [33148]	2151 [85]	970 [38]
			HC6J	15195 [33489]	2136 [84]	972 [38]
			HC6K	15468 [34091]	2110 [83]	975 [38]
		DQFAA,DQFAB DQFAC,DQFAD	HC6G	15419 [33984]	2183 [86]	1008 [40]
			HC6H	15657 [34508]	2163 [85]	1011 [40]
			HC6J	15880 [35000]	2145 [84]	1015 [40]
			HC6K	15955 [35165]	2138 [84]	1016 [40]
			P7B	16041 [35355]	2121 [84]	1017 [40]
			P7C	16436 [36225]	2100 [83]	1022 [40]
		DOMAA	HC5D	12861 [28388]	2100 [82.7]	632 [24.9]
			HC5E	13011 [28719]	2083 [82.0]	632 [24.9]
			HC5F	13151 [29028]	2019 [79.5]	632 [24.9]
			HC6G	13211 [29160]	2050 [80.7]	640 [25.2]
			HC6H	13449 [29685]	2024 [79.7]	640 [25.2]

*** WEIGHT & CG'S ARE SHOWN WITH F202 STEEL ENCLOSURE, AND STANDARD WET GENSET. ADDITION OF OTHER FEATURES MAY CHANGE THE WEIGHT. FOR F205 ENCLOSURE (ALUMINUM) REDUCE WEIGHT BY 924 (2036)

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS
DIM: X ±1; .X ±0.8; .XX± 0.38
HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13
ANG TOL: ± 1.0° | SCALE: 1/1

SIM TO 0500-4208
DO NOT SCALE PRINT

- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP

FIRST USED ON DFHD

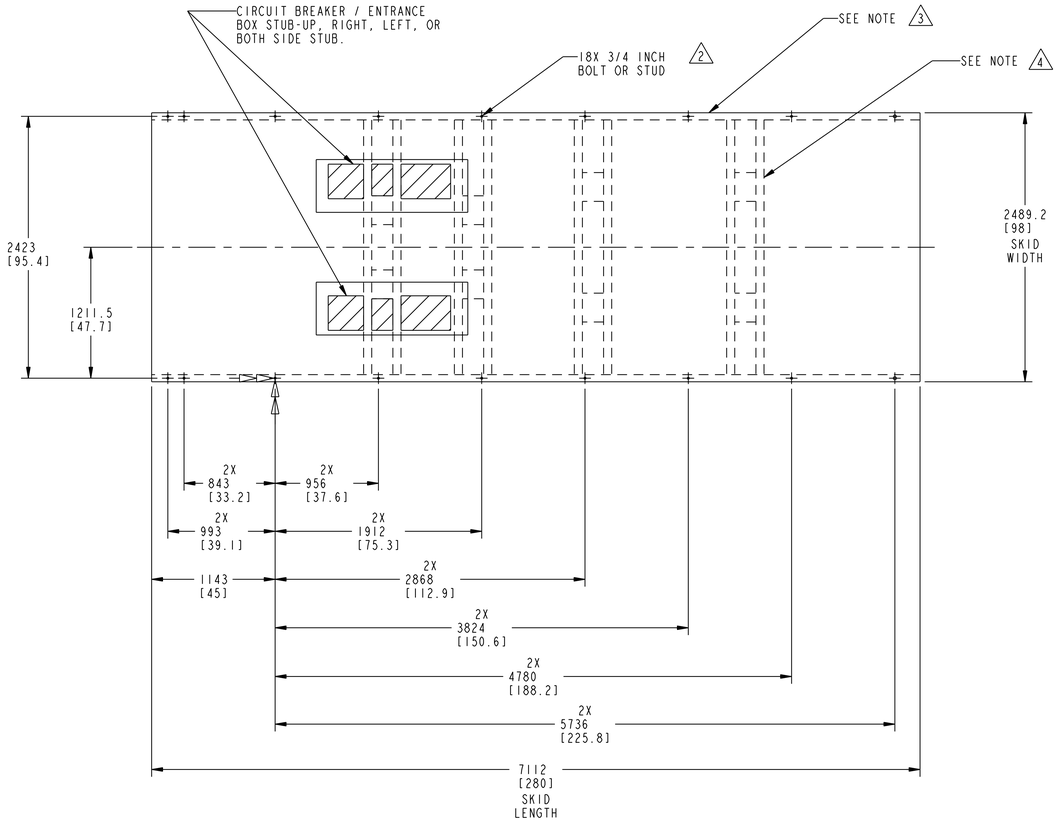
DWN M_JOHNSON
CKD Z_MOGES
APVD Z_MOGES
DATE 20JAN11
SITE CODE PGF

CUMMINS POWER GENERATION

OUTLINE,FUEL SYSTEM (TANKS)

DWG SIZE E | A035H278 | SHEET 3 of 4 | DWG REV B

REL NO	LTR	NO	REVISION	DWN	CKD	APVD	DATE
ECO-114582	B	2	ZONES A-1/2 ADD DQMAA FOUNDATION VIEW	MRJ	ZYM	Z_MOGES	08FEB11



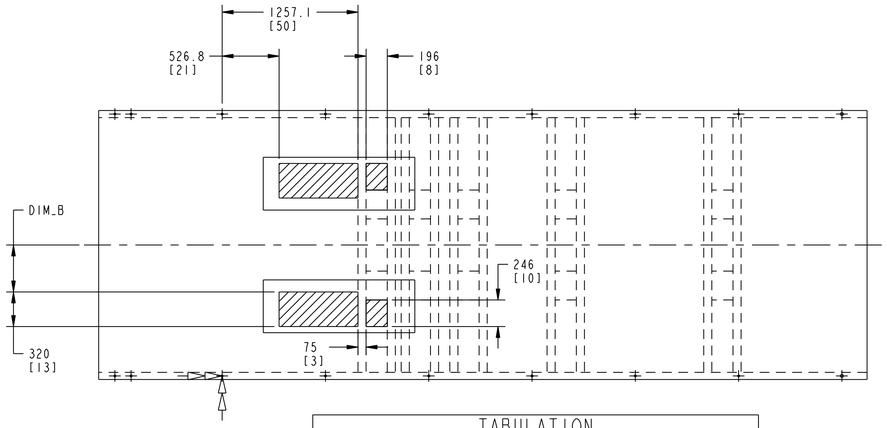
NOTE:

1. DIMENSIONS IN [ ] ARE IN INCHES.

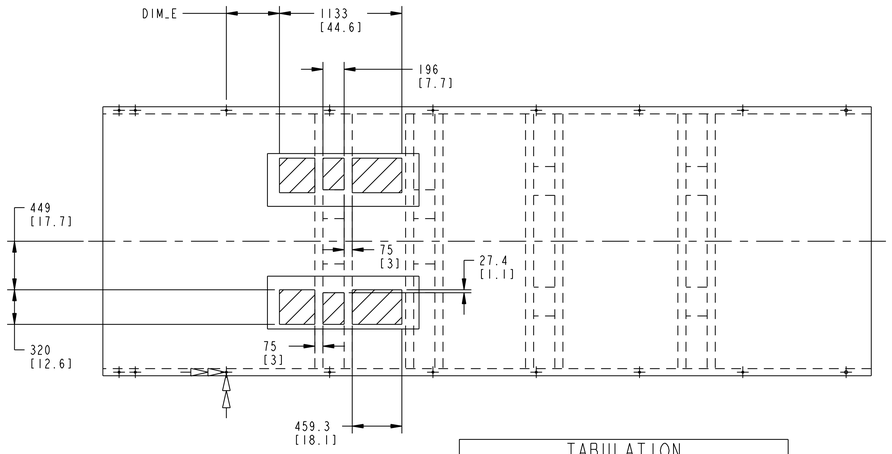
2. FUEL TANK HAS A FLANGE THICKNESS OF 6.4mm [.25 INCHES] ALLOW EXTRA LENGTH ON HARDWARE FOR UNEVENESS OF MOUNTING SURFACE. (MOUNTING DIMENSIONS PERTAIN TO ALL FUEL TANKS)

3. LIFTING BASE OR FUEL TANK PARIMETER IS SHOWN. FOUNDATION SHOULD BE EXTENDED BEYOND THIS PERIMETER. SEE (T030) APPLICATION MANUAL.

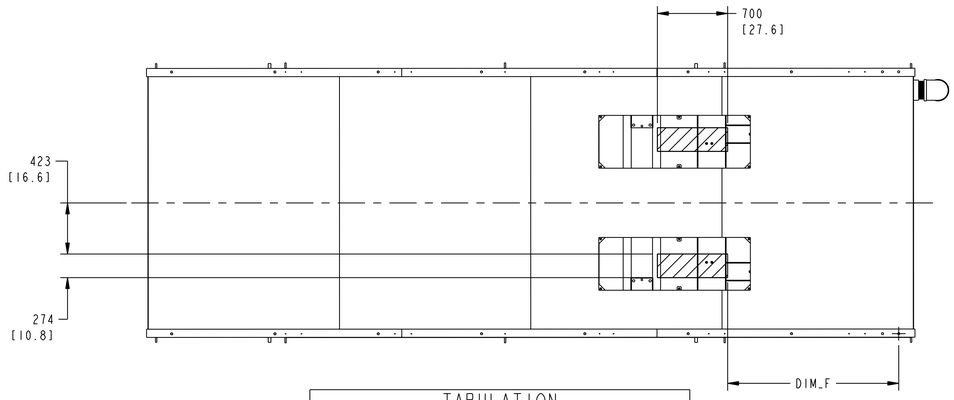
4. HIDDEN LINES REPRESENT LIFT BASE CROSSMEMBERS.



TABULATION			
GENSET	GENERATOR	DIM_A	DIM_B
DQFAA, DQFAB DQFAC, DQFAD	HC6G/H/J	527 [20.7]	434.5 [17.1]
	HC6K	425 [16.7]	
	P7B7C	444 [17.5]	448.7 [17.7]



TABULATION		
GENSET	GENERATOR	DIM_E
DQCA, DQCB DQCC	HC6G/H/J	491.3 [19.3]
	HC6K	391.3 [15.4]



TABULATION		
GENSET	GENERATOR	DIM_F
DQMAA	HC5D, E & ALL HC6	1062 [41.8]
	HC5F	987 [38.8]

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS	SIM 10: 0500-4208	DWN M_JOHNSON	CUMMINS POWER GENERATION
DIM: X ±1, .X ±0.8, .XX± 0.38 — HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13	DO NOT SCALE PRINT	CKD Z_MOGES	OUTLINE, FUEL SYSTEM (TANKS)
ANG TOL: ± 1.0°	SCALE: 1/1	APVD Z_MOGES	
	- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP	DATE 20JAN11	SITE CODE
	FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994	FIRST USED ON DFHD	PGF
		SIZE E	A035H278 SHEET 4 of 4 REV B

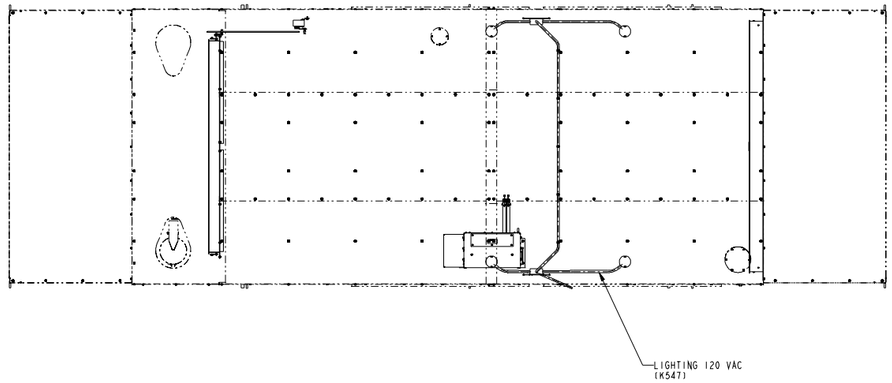
0500_4203	E	Pro/ENGINEER	METRIC DWG

REL NO	LTR	NO	REVISION	ZONE	BY	CHKR	APPROVED	DATE
FRD23539	A	1	PRODUCTION_RELEASE	-	YJ	RC	RC	04-08-05
FRD34213	B	1	ADD_DOMAA_TO_TABLE	3D	TA	TA	BH	10-24-07
		2	REVISE_BATTERY_CHARGER_NOTE	3B	TA	TA	BH	10-24-07
		3	813 [32] WAS 588 [23]	3A	TA	TA	BH	10-24-07
FRD30834	C	1	ADD_DQFAA,AB,AC,AD TO MODEL CALLOUT	3D	NDM	DA	DA	11-01-07

TABULATION

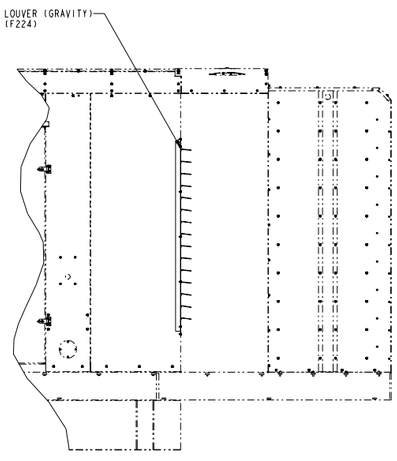
USE WITH MODELS	ENCLOSURE FEATURE CODE	FUEL TANK		DIM_A
		FEATURE CODE	CAPACITY GALLONS	
DFGB,GE DFHA,HB,HC,HD DQCA,CB,CC DQMAA DQFAA,AB,AC,AD	NO FUEL TANK	---	---	---
	F200, F203 (WEATHER) F201, F204 (QUITE SIDE 1) F202, F205 (QUITE SIDE 2)	C249	200	355.6 [14]
		C205	660	
		C250	1000	457.2 [18]
		C251	1500	584.2 [23]
		C252	2000	
		C253	2400	

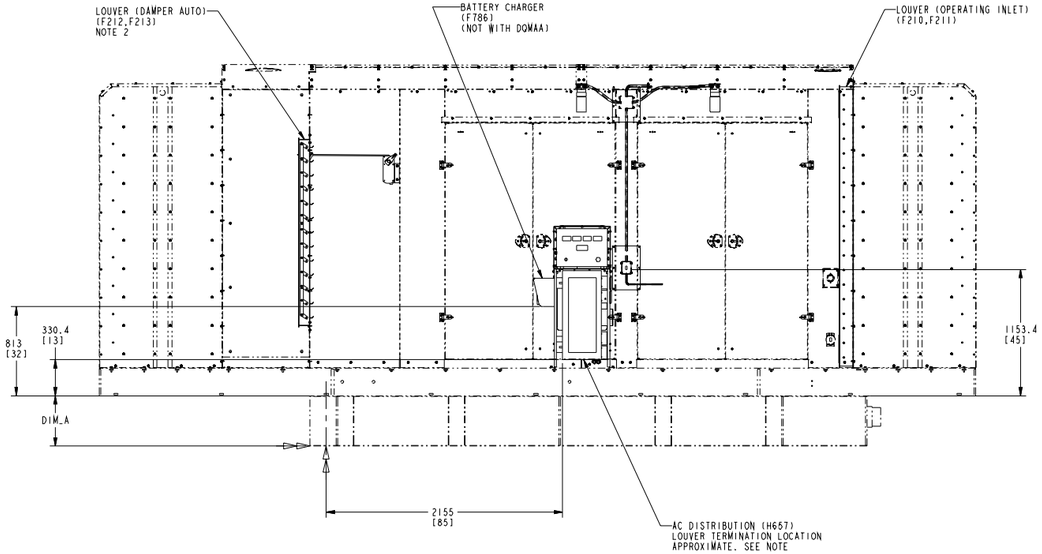
C1



NOTES:

1. WITH AN AC DISTRIBUTION PANEL (H657) THE MOTORIZED LOUVERS ARE PREWIRED. WITHOUT AN AC DISTRIBUTION PANEL, 18GA WIRING FOR MOTORIZED LOUVERS IS TERMINATED IN THE AC DISTRIBUTION PANEL LOCATION.
2. DIMENSION IN [ ] ARE INCHES.
3. SEE FOUNDATION DRAWING FOR REFERENCE POINT LOCATION (⟶▷)



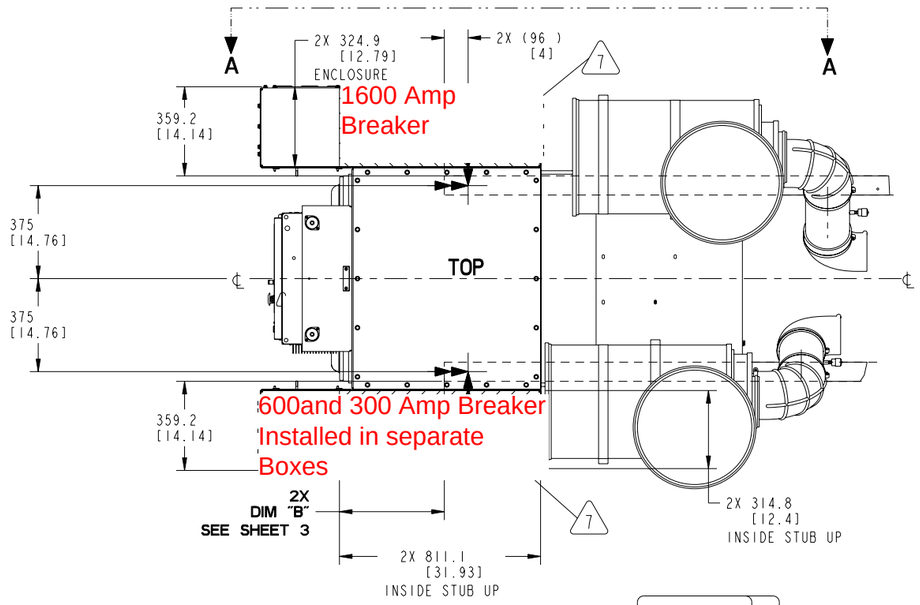


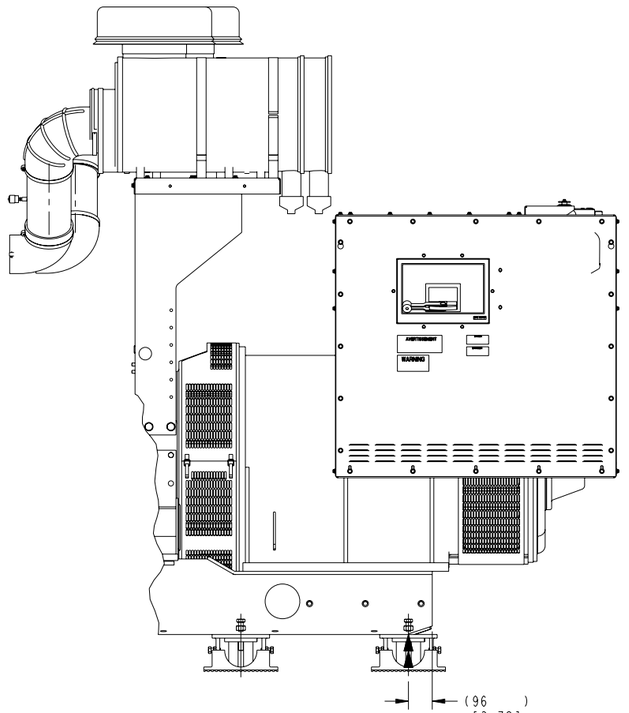
DO NOT SCALE PRINT	TOLERANCE UNLESS OTHERWISE SPECIFIED			DRAWN	N. MODI	04-08-05	CUMMINS POWER GENERATION	
	DIM	MIN	MAX	CHECKED	R.CHANGELA	04-08-05		
ANG TOL ± 0°	X ± 2.5 [.10]	X .4 [.015]		ENGR MGR PROJECTION				
DRAWN TO SCALE OF 1/16	.X ± 0.38 [.015]			APPROVED	R.CHANGELA	04-08-05	SITE CODE	PGA
	.XX ± 0.25 [.010]	.39 [.015]	.406 [.016]				TITLE	GENSET_OUTLINE (OPTIONS)
	.XXX ± 0.127 [.005]	.381 [.015]	.394 [.016]				SIZE	DWG NO 0500_4203
	.XXXX ± 0.0127 [.0005]	.37 [.015]	.381 [.015]				D	SHT 1 OF 1
	.XXXXX ± 0.00127 [.00005]	.368 [.0145]	.373 [.0147]					

THIS DRAWING IS THE PROPERTY OF CUMMINS POWER GENERATION AND IS LOANED SUBJECT TO RETURN ON DEMAND. IT IS NOT TO BE REPRODUCED OR COPIED IN WHOLE OR IN PART. IT IS NOT TO BE USED IN THE MANUFACTURE OR SALE OF APPARATUS, DEVICES OR PARTS EXCEPT UNDER WRITTEN AGREEMENT WITH CUMMINS POWER GENERATION.

DQCA

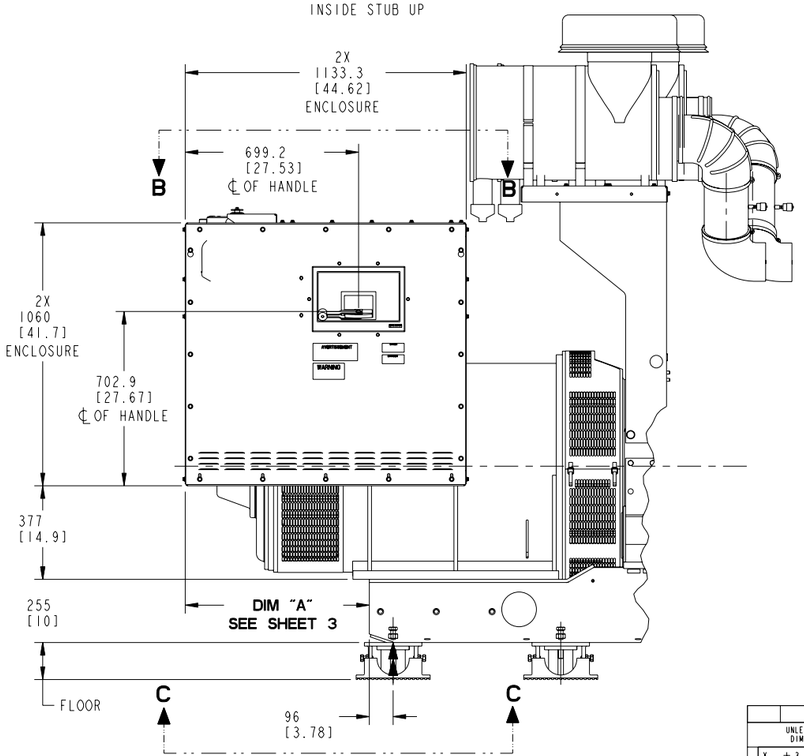
REL NO	LTR	NO	REVISION	ZONE	DWN	CKD	APVD	DATE
ECO-100339	B	1	SEE ECO FOR DETAILS	-	SMM	MT	MT	06-11-08





VIEW **A-A**
(ROTATED 180°)

LEFT SIDE ENTRY 11



RIGHT SIDE ENTRY

NOTE:

1. DIMENSIONS SHOWN IN [ ] ARE IN INCHES.
2. COMMON REFERENCE POINT ON GENSET SKID (⟶). POINTS TO ANCHORING HOLE ON SKID. SEE GENSET_OUTLINE (FOUNDATION) FOR DETAILS.
3. LISTED TORQUE VALUES ARE FOR MAXIMUM CONDUCTOR SIZES ACCOMMODATED. CONSULT UL 486 TABLE 7-4, 7-5 AND 7-6 FOR SMALLER CONDUCTOR SIZES.
4. ALL ITEMS SHOWN IN ILLUSTRATION ARE FOR REFERENCE ONLY.
5. ELECTRICAL CONDUITS MUST:
   - PROVIDE FLEXIBLE CONNECTION (USING FLEXIBLE CONDUIT AND CABLES). -LFMC
   - INSTALLED IN A WAY THAT IT WILL ABSORB OR REDUCE VIBRATION CONDITIONS, FOR EXAMPLE: ADD OFF-SET BENDS, BETWEEN THE MOUNTING SURFACE OF THE CIRCUIT BREAKER ENCLOSURE AND THE STUB AREA ORIGINATING IN CONCRETE OR THE TYPE OF BASE FLOORING.
6. FLEXIBLE CONDUITS MUST ALLOW FOR GENERATOR SET MOVEMENT AS MUCH AS ±50 [2] IN THE VERTICAL DIRECTION.
7. AREA SHOWN INDICATES APPROXIMATE OFFSET PLACEMENT OF THE ELECTRICAL FLEXIBLE CONDUIT STUB-UP AREA ORIGINATING IN CONCRETE OR OTHER TYPE OF BASE FLOORING RELATIVE TO CIRCUIT BREAKER LOCATION WITHIN ENCLOSURE TO PROVIDE VIBRATION PROTECTION.
8. WIRE-CONDUIT COMBINATIONS MEET NEC AND CEC. TO USE OTHER COMBINATIONS, REFER TO APPLICABLE CODES TO ENSURE THAT WIRE AMPACITY, BEND SPACE AND GUTTER SPACE MEET THE REQUIREMENTS.
9. SHUNT TRIP UNITS CAN BE OPERATED AT 75% OF NOMINAL VOLTAGE AND WILL ACCEPT MOMENTARY OR CONTINUOUS APPLIED VOLTAGE.
10. SHUNT TRIP UNITS CAN BE OPERATED AT 70% TO 100% OF NOMINAL VOLTAGE AND WILL ACCEPT MOMENTARY OR CONTINUOUS APPLIED VOLTAGE.
11. ALL DIMENSIONS SHOWN FOR RIGHT SIDE ENTRY ALSO APPLY TO LEFT SIDE ENTRY IN MIRROR ORIENTATION.
12. ALTERNATOR MODEL P734C & R-FRAME CIRCUIT BREAKER ARE BEING SHOWN FOR DRAWING SIMPLICITY.
13. "NS" SHUNT TRIP HAS NO INTERNAL CONTACTS, IT MUST BE USED IN CONJUNCTION WITH AUXILIARY CONTACTS TO ACCEPT CONTINUOUS APPLIED VOLTAGE. IT CAN OPERATE AT 75% OF NOMINAL VOLTAGE.
14. 800 AMP BREAKER:
    A LUG ACCEPTING (2) 3/0-600 kcmil CONDUCTORS IS AVAILABLE THRU ACCESSORIES. PGA PART NUMBER 0332-4278.
15. 1200 AMP BREAKER:
    A LUG ACCEPTING (3) 3/0-600 kcmil CONDUCTORS IS AVAILABLE THRU ACCESSORIES. PGA PART NUMBER 0332-4279.

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE
X	±3	0.00- 4.99 +0.15/-0.08
.X	±0.8	5.00- 9.99 +0.20/-0.10
.XX	±0.38	10.00-17.49 +0.25/-0.13
		17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 3/32

SIM TO .
DO NOT SCALE PRINT

- CONFIDENTIAL -
PROPERTY OF CUMMINS POWER GENERATION GROUP

DRN LANDRUS
CKD L_NAVARRETE
APVD L_NAVARRETE
DATE 12-15-06

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994

FIRST USED ON DFHA,B,C,D

SITE CODE PGF

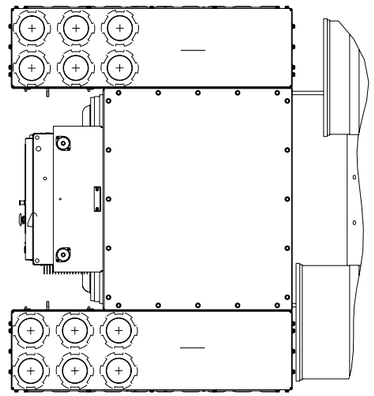
CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

CIRCUIT BRKR OUTLINE
(30 LITER)

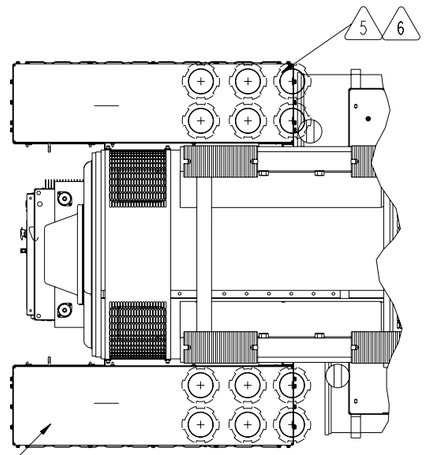
DWG SIZE D | 0500_4538 | SHEET 1 of 3 | DWG REV B

Pro/ENGINEER

REL NO	LTR	NO	REVISION	ZONE	DWN	CKD	APVD	DATE
ECO-100339	B	1	SEE ECO FOR DETAILS	-	SMM	MT	MT	06-11-08

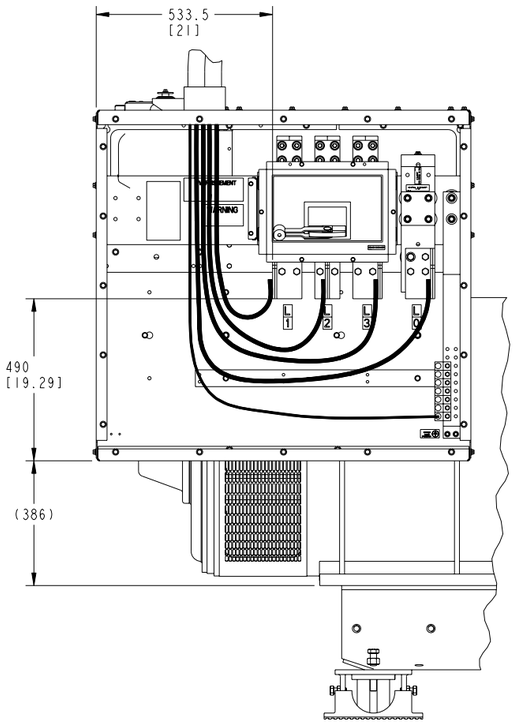


VIEW **B-B**
TOP ENTRANCE
SCALE 3/32

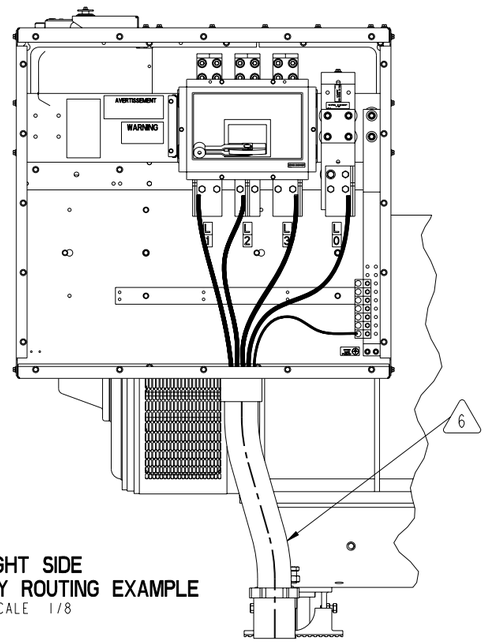


BOTTOM OF CIRCUIT BREAKER BOX

VIEW **C-C**
BOTTOM ENTRANCE
SCALE 3/32



RIGHT SIDE
TOP ENTRY ROUTING EXAMPLE
SCALE 1/8



RIGHT SIDE
BOTTOM ENTRY ROUTING EXAMPLE
SCALE 1/8

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE
X	± 3	0.00- 4.99 +0.15/-0.08
.X	± 0.8	5.00- 9.99 +0.20/-0.10
.XX	± 0.38	10.00-17.49 +0.25/-0.13
		17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 3/64

SIM TO .
DO NOT SCALE PRINT
- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994

DRN	LANDRUS
CKD	L_NAVARRETE
APVD	L_NAVARRETE
DATE	12-15-06
FIRST USED ON	DFHA,B,C,D
SITE CODE	PGF

CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

CIRCUIT BRKR OUTLINE
(30 LITER)

DWG SIZE: D | 0500_4538 | SHEET: 2 of 3 | DWG REV: B

Pro/ENGINEER

REL NO	LTR	NO	REVISION	ZONE	DWN	CKD	APVD	DATE
ECO-100339	B	1	SEE ECO FOR DETAILS	-	SMM	MT	MT	06-11-08

TABLE 1

UL/IEC LUGS					ACCESSORY SPECIFICATIONS			
LUG	FRAME	MAX AMPS	WIRE RANGE COPPER	DIM D ±25 [1.0]	ACCESSORY DESCRIPTION	CONTACT RATING	INRUSH	CONNECTION TYPE
	SQUARE D NSJ	400A 3 OR 4 POLE	#2-600 KCMIL	554 [21.8]	24 VDC SHUNT TRIP	----------	10A (10)	COMPRESSION TERMINALS #20-16 AWG OR SMALLER TORQUE: 10 LB-IN
	SQUARE D NSJ W/STR23SP TRIP UNIT	600A 3-POLE	2/0-350 KCMIL	554 [21.8]	24 VDC SHUNT TRIP	----------	10A (10)	COMPRESSION TERMINALS #20-16 AWG OR SMALLER TORQUE: 10 LB-IN
					1 EA. FORM C 1 AUX CONTACT + 1 TRIP ALARM	6A AT 240 VAC, 6A AT 480 VAC, 3A AT 600 VAC, 2.5A AT 48 VDC, 0.8A AT 125VDC, 0.3A AT 250 VDC	----	
(14)	SQUARE D P 800 W/MICROLOGIC 3.0 TRIP UNIT	800A 3-POLE	3/0-500 KCMIL	599 [23.5]	24 VDC SHUNT TRIP	----------	200VA (10)	COMPRESSION TERMINALS FOR 1 OR 2 #18-14 AWG. TORQUE: 10 LB-IN
					1 EA. FORM C 1 AUX CONTACT + 1 TRIP ALARM	6A AT 240 VAC, 6A AT 480 VAC, 3A AT 600 VAC, 2.5A AT 48 VDC, 0.8A AT 125VDC, 0.3A AT 250 VDC	----	COMPRESSION TERMINALS FOR 1 OR 2 #18-16 AWG. TORQUE: 10 LB-IN
(15)	SQUARE D P 1200 W/MICROLOGIC 3.0 TRIP UNIT	1200A 3-POLE	3/0-500 KCMIL	556 [21.8]	24 VDC SHUNT TRIP	----------	200VA (10)	COMPRESSION TERMINALS FOR 1 OR 2 #18-14 AWG. TORQUE: 10 LB-IN
					1 EA. FORM C 1 AUX CONTACT + 1 TRIP ALARM	6A AT 240 VAC, 6A AT 480 VAC, 3A AT 600 VAC, 2.5A AT 48 VDC, 0.8A AT 125VDC, 0.3A AT 250 VDC	----	COMPRESSION TERMINALS FOR 1 OR 2 #18-16 AWG. TORQUE: 10 LB-IN
	SQUARE D R 2500/2000/1600 3-POLE 1600-2500 AMP BUS BARS STANDARD W/MICROLOGIC 3.0 TRIP UNIT	NEMA HOLE PATTERN		490 [19]	24 VDC SHUNT TRIP	----------	200VA (10)	COMPRESSION TERMINALS FOR 1 OR 2 #18-14 AWG. TORQUE: 10 LB-IN
					1 EA. FORM C 4 AUX CONTACT + 1 TRIP ALARM	6A AT 240 VAC, 6A AT 480 VAC, 3A AT 600 VAC, 2.5A AT 48 VDC, 0.8A AT 125VDC, 0.3A AT 250 VDC	----	COMPRESSION TERMINALS FOR 1 OR 2 #18-16 AWG. TORQUE: 10 LB-IN
	(3) R 2500/2000/1600 W/OPTIONAL LUG 1600-2500 AMP BREAKERS TORQUE 375 IN LBS [42 Nm]	#2-600 KCMIL		490 [19]	24 VDC SHUNT TRIP	----------	200VA (10)	COMPRESSION TERMINALS FOR 1 OR 2 #18-14 AWG. TORQUE: 10 LB-IN
					1 EA. FORM C 4 AUX CONTACT + 1 TRIP ALARM	6A AT 240 VAC, 6A AT 480 VAC, 3A AT 600 VAC, 2.5A AT 48 VDC, 0.8A AT 125VDC, 0.3A AT 250 VDC	----	COMPRESSION TERMINALS FOR 1 OR 2 #18-16 AWG. TORQUE: 10 LB-IN

TABLE 2

TYPICAL CONDUIT AND WIRE SIZE BASED ON NEC 2008, ARTICLE 310.15 AT 75C TEMPERATURE RATED CONDUCTOR AT 30C AMBIENT AND ANNEX C (LIQUID TIGHT FLEXIBLE METAL CONDUIT - LFMC)

(8)

MAX BRKR AMPS	WIRE (COPPER)		CABLE AMPACITY	TOTAL NUMBER OF CONDUITS	
	QTY	SIZE		QTY	SIZE (IN INCHES)
2500	6	600 KCMIL	420	6	4
2000	5	600 KCMIL	420	5	4
1600	5	600 KCMIL	420	5	4
1200	3	500 KCMIL	385	3	3
1000	3	400 KCMIL	335	3	3
800	2	300 KCMIL	285	2	3
630	2	350 KCMIL	310	2	3
600	2	350 KCMIL	310	2	3
400	1	600 KCMIL	420	1	4
250	1	250 KCMIL	255	1	2 1/2
100	1	2 KCMIL	115	1	2

TYPICAL CONDUIT AND WIRE SIZE BASED ON NEC 2008, ARTICLE 310.15 AND TABLE 310-16 AT 75C TEMPERATURE RATED CONDUCTOR AT 40C AMBIENT AND ANNEX C (LIQUID TIGHT FLEXIBLE METAL CONDUIT - LFMC)

(8)

MAX BRKR AMPS	WIRE (COPPER)		CABLE AMPACITY	TOTAL NUMBER OF CONDUITS	
	QTY	SIZE		QTY	SIZE (IN INCHES)
2500	6	750 KCMIL	418	6	4
2000	5	700 KCMIL	405	5	4
1600	4	700 KCMIL	405	4	4
1000	3	500 KCMIL	334	3	3 1/2
800	3	350 KCMIL	273	3	3

TABLE 3

GENSET MODEL	ALTERNATOR MODEL	DIM "A"	DIM "B"
❑ DFHA ❑ DFHB ❑ DFHC ❑ DFHD ❑ DQFAA ❑ DQFAB ❑ DQFAC ❑ DQFAD	❑ HC634G	659.2 [25.95]	337.0 [13.27]
	❑ HC634H	659.2 [25.95]	337.0 [13.27]
	❑ HC634J	659.2 [25.95]	337.0 [13.27]
	❑ HC634K	760.3 [29.93]	438.1 [17.25]
	❑ P734B	742.6 [29.24]	420.4 [16.55]
	❑ P734C	742.6 [29.24]	420.4 [16.55]

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM: X ±3, .X ±0.8, .XX±0.38 — HOLE: 0.00-4.99 +0.15/-0.08; 5.00-9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 3/64

SIM TO .

DO NOT SCALE PRINT

- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP

DWN LANDRUS
CKD L_NAVARRETE
APVD L_NAVARRETE
DATE 12-15-06
FIRST USED ON DFHA,B,C,D
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994

SITE CODE PGF

CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

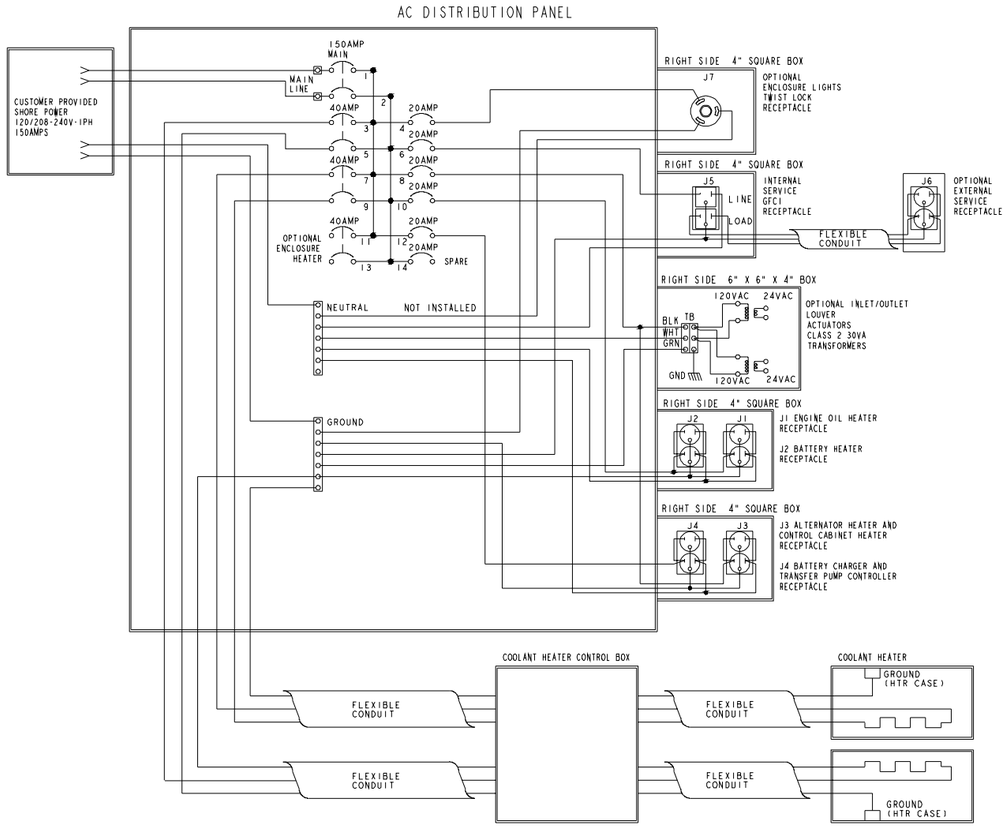
CIRCUIT BRKR OUTLINE
(30 LITER)

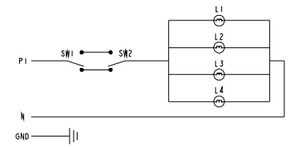
DWG SIZE D | 0500_4538 | SHEET 3 of 3 | DWG REV B

Pro/ENGINEER

0620_0281	E	Pro/ENGINEER	METRIC DWG

REL NO	LTR	NO	REVISION	ZONE	BY	CHKR	APPROVED	DATE
FR023539	A	1	PRODUCTION_RELEASE	-	JJJ	LN	LN	11-12-04





AC LIGHTING KIT
SCHEMATIC DIAGRAM

TABULATION-LABEL LIST		
FROM	TO	DESCRIPTION-LABEL
CB1	CUSTOMER POWER SUPPLY	MAIN BREAKER
CB2	ENGINE COOLANT HEATER	COOLANT HEATER
CB3		
CB5		
CB7	ENGINE COOLANT HEATER	COOLANT HEATER
CB9		
CB11	ENCLOSURE HEATER	OPTIONAL ENCLOSURE HEATER
CB13		
CB4	J7	OPTIONAL ENCLOSURE LIGHTS
CB6	J5	SERVICE RECEPTACLES
	J6	
CB8	J3	J3: ALTERNATOR AND CONTROL CABINET HEATER/OPTIONAL LOUVER ACTUATORS
	LOUVER 120/24 VAC TX	
CB10	J1	ENGINE OIL HEATER
	J2	BATTERY HEATER
CB12	J4	BATTERY CHARGER AND TRANSFER PUMP CONTROL
CB14	SPARE	SPARE

ITEM	PART NO	QTY	DESCRIPTION OR MATERIAL	REV

DRAWN	JJOHNSON	11-04-04	
CHECKED	L_NAVARRETE	11-04-04	
APPROVED	L_NAVARRETE	11-04-04	SITE CODE
	DFHD		PGA

DO NOT SCALE PRINT

ANG TOL± 1.0 °

DRAWN TO SCALE OF 1/1

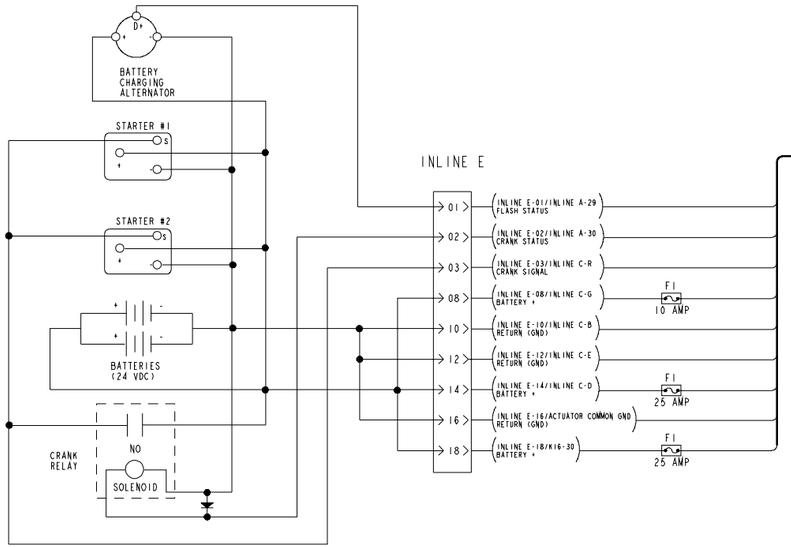
CUMMINS POWER GENERATION
MIN, MN, USA
MIDDLEFIELD, WISCONSIN, USA

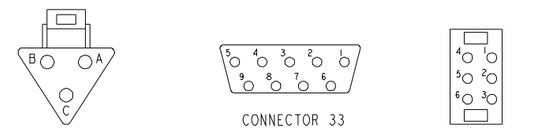
TITLE: CONNECTION_DIAGRAM (PCC3100)

DWG NO 0620_0281 | SHEET 2 OF 2 | REV E

ENGINE STARTER/POWER HARNESS

REL NO	LTR	NO	REVISION	ZONE	DRN	CKD	APVD	DATE
FRD25434	A	1	PRODUCTION_RELEASE	-	LJK	LN	LN	10-26-05
FRD27825	B	1	INLINE E WAS INLINE C	1D	LJK	LJK	LEN	05-18-06

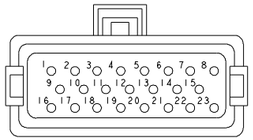

BATTERY CHARGING ALTERNATOR
STARTER #1
STARTER #2
BATTERIES (24 VDC)
CRANK RELAY
NO
SOLENOID
INLINE E
01 (INLINE E-01/INLINE A-29 FLASH STATUS)
02 (INLINE E-02/INLINE A-30 CRANK STATUS)
03 (INLINE E-03/INLINE C-R CRANK SIGNAL)
08 (INLINE E-08/INLINE C-G BATTERY +) F1 10 AMP
10 (INLINE E-10/INLINE C-B RETURN (GND))
12 (INLINE E-12/INLINE C-E RETURN (GND))
14 (INLINE E-14/INLINE C-D BATTERY +) F1 25 AMP
16 (INLINE E-16/ACTUATOR COMMON GND RETURN (GND))
18 (INLINE E-18/K16-30 BATTERY +) F1 25 AMP
B1
INLINE E
TO SHEET 2
INLINE F
TO SHEETS 3 & 6
INLINE F
ENGINE COOLANT HEATER CONTROL (REFER TO THE SPECIFIC WIRING DIAGRAM)
F-A
F-B
F-C
A (INLINE F-A/TB5-6 BATTERY +)
B (INLINE F-B/TB3-6 SWITCH B+)
C (INLINE F-C/TB5-12 RETURN (GND))



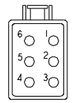
OEM J1939
INLINE-F

CONNECTOR 33

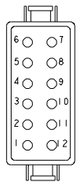
CONNECTOR 10



CONNECTOR 07
CONNECTOR 31
CONNECTOR 23



CONNECTOR 30
INLINE D



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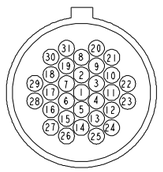
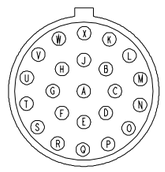
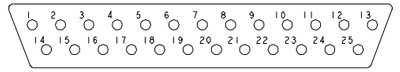


INLINE A



INLINE B



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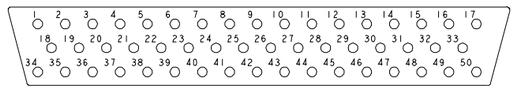
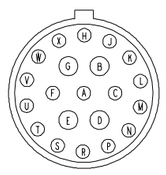


CONNECTOR 02
CONNECTOR 05
CONNECTOR 09



INLINE C

INLINE E

CONNECTOR CAVITIES

(VIEW LOOKING INTO BACK OF CONNECTOR WHERE CONTACTS ARE INSERTED)

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM: X ±1 / .X ±0.8 / .XX± 0.38

HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0°

SCALE: 1/1

SIM TO .

DO NOT SCALE PRINT

- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP

DRN L KAPLAN
CKD L. NAVARRETE
APVD L. NAVARRETE
DATE 10-26-05

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994

FIRST USED ON DQGAA,B

SITE CODE PGF

CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

WD-INTERCONNECTION

DRG SIZE D | 0630_3210 | SHEET 1 of 7 | DRG REV B

Pro/ENGINEER

REL NO	LTR	NO	REVISION	ZONE	DRN	CKD	APVD	DATE
FRD25434	A	1	PRODUCTION_RELEASE	-	LJK	LN	LN	10-26-05
FRD27825	B	--	--------	--	--	--	--	--

ENGINE HARNESS & SENSORS

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE
X	± 1	0.00- 4.99 +0.15/-0.08
.X	± 0.8	5.00- 9.99 +0.20/-0.10
.XX	± 0.38	10.00-17.49 +0.25/-0.13
		17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 1/1

SIM TO .

DO NOT SCALE PRINT

- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP

DWN L KAPLAN
CKD L. NAVARRETE
APVD L. NAVARRETE
DATE 10-26-05

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994

FIRST USED ON DQGAA,B

CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

WD-INTERCONNECTION

SITE CODE PGF

DWG SIZE D | 0630_3210 | SHEET 2 OF 7 | DRG REV B

Pro/ENGINEER

REL NO	LTR	NO	REVISION	ZONE	DRN	CKD	APVD	DATE
FRD25434	A	1	PRODUCTION_RELEASE	-	LJK	LN	LN	10-26-05
FRD27825	B	--	--------	--	--	--	--	--

TO SHEET 2 ← CONN 21
TO SHEET 2 ← CONN 23
TO SHEET 1 ← INLINE F (COOLANT HEATERS)
TO SHEET 2 ← INLINE D
TO SHEET 2 ← DC-POWER

INLINE D
(INLINE D-05/05-05) MANUAL MODE → 5 → (LINE D-5/23-18) MANUAL MODE
(INLINE D-04/05-18) RUN STATUS → 4
(INLINE D-03/05-16) RUN SUPPLY → 3 → K15 2 1 RUN → (K15-1/TB3-5) SWITCHED B+
(INLINE D-02/05-16) CRANK SUPPLY → 2
(INLINE D-01/INLINE C-B) CRANK SIGNAL → 1 → K14 2 1 CRANK

TB5
1 (TB5-1/09-50) BATTERY +
2
3 (TB5-3/TB6-1) BATTERY +
4
5
6 (TB5-6/05-16) BATTERY + → (TB5-6/INLINE F-A) BATTERY +
7 (TB5-7/09-47) RETURN-GND
8 (TB5-8/09-48) RETURN-GND
9 (TB5-9/09-02) RETURN-GND
10
11 (TB5-11/TB6-2) RETURN-GND
12 (TB5-12/05-46) RETURN-GND → (TB5-12/INLINE F-C) RETURN-GND

CONN 07
1 (07-1/TB3-67) UTILITY BREAKER TRIP 2 RELAY N/O CONTACT
2 (07-2/TB3-32) FIRST START ENABLE SWITCH
3 (07-3/TB3-24) LOAD DEMAND SHUTDOWN SWITCH
11 (07-11/TB3-29) COMMON WARNING RELAY DRIVER
5 (07-5/TB3-38) RAMP LOAD/UNLOAD SWITCH
6 (07-6/TB3-35) SINGLE MODE ENABLE SWITCH
7 (07-7/TB3-41) EXTERNAL KW +
8 (07-8/TB3-42) EXTERNAL KW -
12 (07-12/TB3-43) EXTERNAL KVAR +
10 (07-10/TB3-44) EXTERNAL KVAR -
4 (07-4/TB3-45)
9 (07-9/TB3-40) SYNC ENABLE SWITCH
16 (07-16/TB3-67) UTILITY BREAKER TRIP 1 RELAY N/O CONTACT
17 (07-17/TB3-16) CUSTOMER #4 SWITCH INPUT
18 (07-18/TB3-49) GROUND FAULT METER INPUT
19 (07-19/TB3-50) GROUND FAULT METER RETURN
20 (07-20/TB3-47) GROUND FAULT SWITCH INPUT
21 (07-21/TB3-48) GROUND FAULT SWITCH RETURN
22 (07-22/TB3-17) CUSTOMER SWITCH RETURN
23 (07-23/TB3-15) CUSTOMER #3 SWITCH INPUT

CONN 08
1 (8-1/TB3-54) LOAD SHARE KVAR RETURN
2 (8-2/TB3-53) LOAD SHARE KVAR INPUT
3 (8-3/TB3-52) LOAD SHARE KW RETURN
11 (8-11/TB3-51) LOAD SHARE KW INPUT
12
6 (8-6/TB3-60) UTILITY BREAKER CLOSE 1 RELAY N/O CONTACT
7 (8-7/TB3-69) UTILITY BREAKER CLOSE 2 RELAY N/O CONTACT
8 (8-8/TB3-61) GENSET BREAKER CLOSE 1 RELAY N/O CONTACT
15 (8-15/TB3-62) GENSET BREAKER CLOSE 2 RELAY N/O CONTACT
16 (8-16/TB3-46) AUTO MODE OUTPUT
4 (8-4/TB3-60) GENSET BREAKER TRIP 2 RELAY N/O CONTACT
5 (8-5/TB3-59) GENSET BREAKER TRIP 1 RELAY N/O CONTACT
13 (8-13/TB3-23) LOAD DUMP RELAY DRIVER
14 (8-14/TB3-37) REMOTE LOW FUEL SWITCH INPUT
9 (8-9/TB3-58) GENSET BREAKER POSITION SWITCH INPUT
10 (8-10/TB3-57) GENSET BREAKER INHIBIT SWITCH INPUT
17 (8-17/TB3-58) GENSET BREAKER SWITCH RETURN
18 (8-18/TB3-63) UTILITY BREAKER TPOSITION SWITCH INPUT
19 (8-19/TB3-64) UTILITY BREAKER INHIBIT SWITCH INPUT
20 (8-20/TB3-65) UTILITY BREAKER SWITCH RETURN
(K20-30/TB3-7) DELAY OFF SWITCHED B +) → 30 K20 87 ← (K20-87/TB3-2) B +)
(K20-86/TB3-3) → 86 K20 85
23 (8-23/K20-85) TIME DELAY FUEL SHUTOFF RELAY DRIVER)

GENSET/ PARALLEL PCB
0327-1376

CONN 09
22 (9-22/31-15) GENSET PHASE 1 CT INPUT
23 (9-23/31-14) GENSET PHASE 1 CT COMMON
14 (9-14/31-22) GENSET PHASE 2 CT INPUT
15 (9-15/31-23) GENSET PHASE 2 CT COMMON
5 (9-5/31-8) GENSET PHASE 3 CT INPUT
4 (9-4/31-7) GENSET PHASE 3 CT COMMON
25 (9-25/31-6) GENSET PHASE 1 PT INPUT
24 (9-24/31-5) GENSET PHASE 1 PT COMMON
31 (9-31/31-4) GENSET PHASE 2 PT INPUT
32 (9-32/31-3) GENSET PHASE 2 PT COMMON
41 (9-41/31-2) GENSET PHASE 3 PT INPUT
40 (9-40/31-1) GENSET PHASE 3 PT COMMON
37 (9-37/BUS TB2-2) BUS/UTILITY PHASE 3 PT INPUT
36 (9-36/BUS TB2-1) BUS/UTILITY PHASE 3 PT COMMON
39 (9-39/BUS TB2-4) BUS/UTILITY PHASE 2 PT INPUT
38 (9-38/BUS TB2-3) BUS/UTILITY PHASE 2 PT COMMON
21 (9-21/BUS TB2-6) BUS/UTILITY PHASE 1 PT INPUT
20 (9-20/BUS TB2-5) BUS/UTILITY PHASE 1 PT COMMON
7 (9-7/TB3-30) LOCAL LOW FUEL SWITCH INPUT
43 (9-43/TB3-31) LOCAL LOW FUEL SWITCH RETURN
17 (9-17/TB3-13) CUSTOMER #1 SWITCH INPUT
6 (9-6/TB3-14) CUSTOMER #2 SWITCH INPUT
13 (9-13/TB3-38) CUSTOMER SWITCH RETURN
12 (9-12/TB3-24) SHUTDOWN RELAY DRIVER
16 (9-16/TB3-23) LOAD DUMP RELAY DRIVER
46 (9-46/TB3-21) READY TO LOAD RELAY DRIVER
18 (9-18/TB3-18) RELAY COIL SOURCE

PT/CT
BUS PT
} TO SHEET 4 OR 5

AVR → TO SHEET 4 OR 5
TB3 → TO SHEET 6
LONWORKS → TO SHEET 6

CONN 23
42 (AUTO MODE ACKNOWLEDGE) → 21
8 (REMOTE START LED) → 17
19 (DIGITAL DISPLAY RETURN) → 11
49 (USER I.F. COMMON SHUTDOWN LED OUTPUT) → 16
33 (USER I.F. COMMON WARNING LED OUTPUT) → 20
44 (RUN SWITCH INPUT/EXERCISE LED DVR OUTPUT) → 22
9 (EXERCISE SWITCH INPUT/RUN LED DVR OUTPUT) → 12
26 (AUTO SWITCH INPUT) → 3

CONN 21
28 (USER INTERFACE SWITCHES RETURN) → 5
27 (DIGITAL DISPLAY WAKE-UP INPUT) → 12
45 (USER INTERFACE POWER CONTROL OUTPUT) → 11

POWER COMMAND

DISPLAY PNL
300-5312

SWITCH PNL
300-5211

CONN 23
5 (23-5/SP5)
6 (23-6/SP5)
13 (PANEL LAMP B+ DRIVE)
8 (PANEL LAMP GND)
18 (23-18/INLINE D-5) MANUAL MODE
4 (23-4/SP4)
9 (23-9/6- RESET SW/FFO ENABLE)
1 (23-1/6- LAMP TEST)
15 (23-15/6- LCL E-STOP -)
23 (23-23/6- LCL E-STOP +)

CONN 21
1 (21-1/06-18 RS485 DATA +)
2 (21-2/06-21 RS485 DATA -)
3 (21-3/SP4)
CONN 12
8 (9RXD) → 2
7 (TXD) → 3
9 (WAKEUP) → 6
6 (GND) → 5
10
4 (21-4/SP5)
RS232 DISPLAY PANEL PROGRAM PORT

11 (9-11/TB3-70) UTILITY CT INPUT
10 (9-10/TB3-72) UTILITY CT RETURN
29 (9-29/30-3) AVR CONTROL + OUTPUT
30 (9-30/30-4) AVR CONTROL - OUTPUT
50 (9-50/TB5-1) BATTERY + INPUT
47 (9-47/TB5-7) BATTERY - INPUT
48 (9-48/TB5-8) BATTERY - INPUT
2 (9-2/TB5-9) BATTERY - INPUT

CONTROL WIRING

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS
DIM: X ± 1, .X ± 0.8, .XX ± 0.38
HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13
ANG TOL: ± 1.0° SCALE: 1/1
SIM TO .
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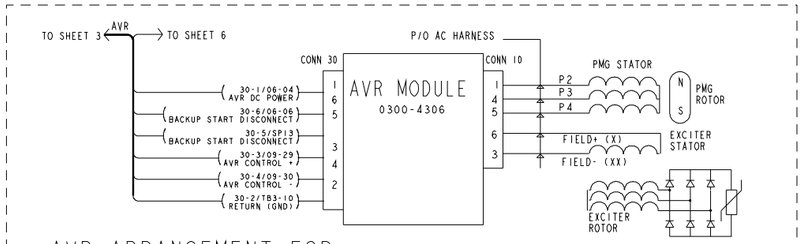
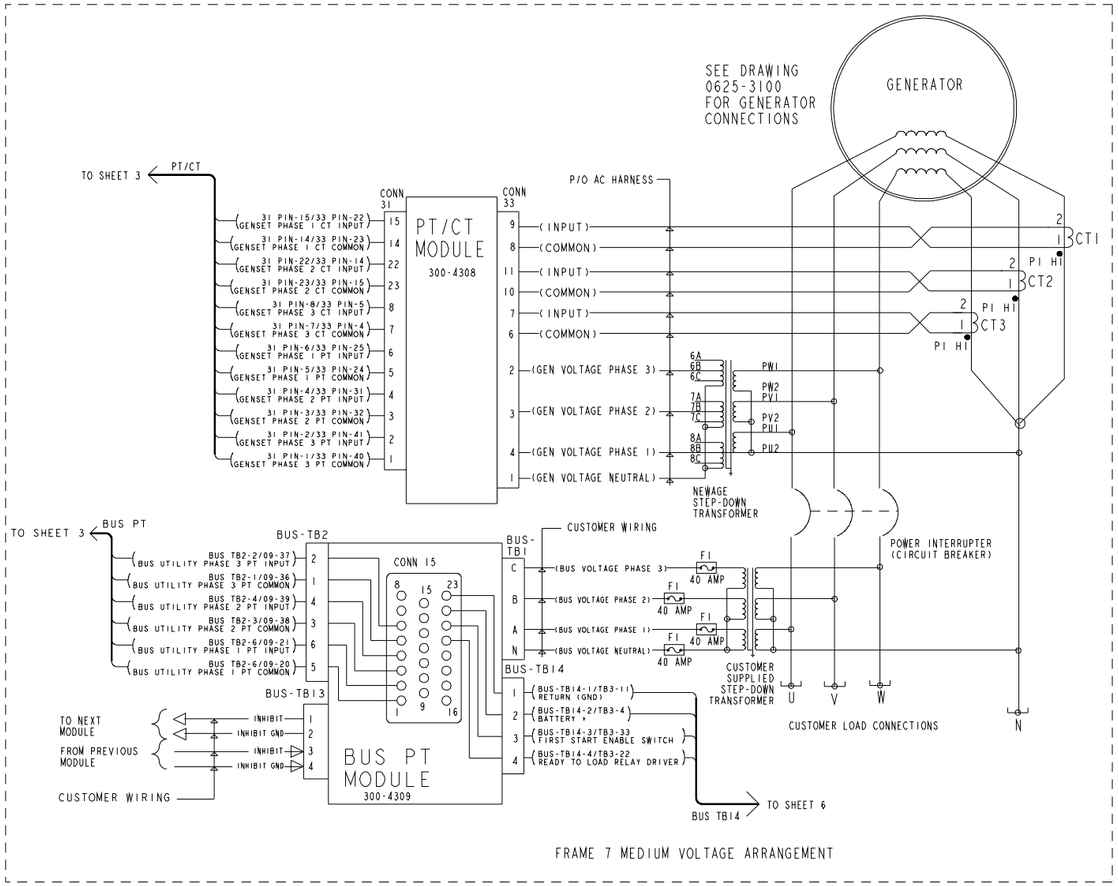
DRN L KAPLAN
CKD L. NAVARRETE
APVD L. NAVARRETE
DATE 10-26-05
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994
FIRST USED ON DQGAA,B
SITE CODE PGF
CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432
WD-INTERCONNECTION
SIZE D | DWG 0630_3210 | SHEET 3 of 7 | DRG REV B
Pro/ENGINEER

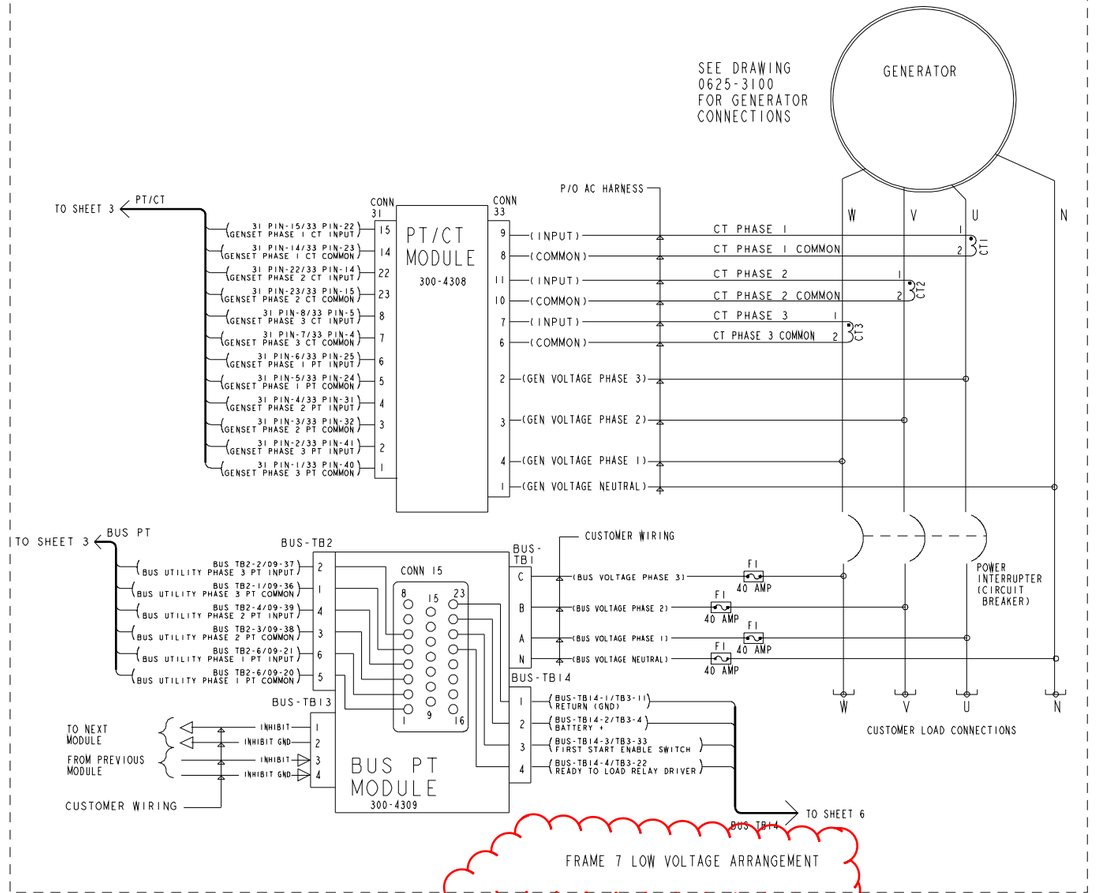
REL NO	LTR	NO	REVISION	ZONE	DRN	CKD	APVD	DATE
FRD25434	A	1	PRODUCTION_RELEASE	-	LJK	LN	LN	10-26-05
FRD27825	B	--	--------	--	--	--	--	--



AVR ARRANGEMENT FOR FRAME 7 ALTERNATORS



FRAME 7 MEDIUM VOLTAGE ARRANGEMENT



FRAME 7 LOW VOLTAGE ARRANGEMENT

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE
X	± 1	0.00- 4.99 +0.15/-0.08
.X	± 0.8	5.00- 9.99 +0.20/-0.10
.XX	± 0.38	10.00-17.49 +0.25/-0.13
		17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 1/1

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DWN	L KAPLAN
CKD	L. NAVARRETE
APVD	L. NAVARRETE
DATE	10-26-05

FOR INTERPRETATION OF DIMENSIONS AND TOLERANCES SEE ASME Y14.5M-1994

FIRST USED ON DQGAA,B

SITE CODE PGF

CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

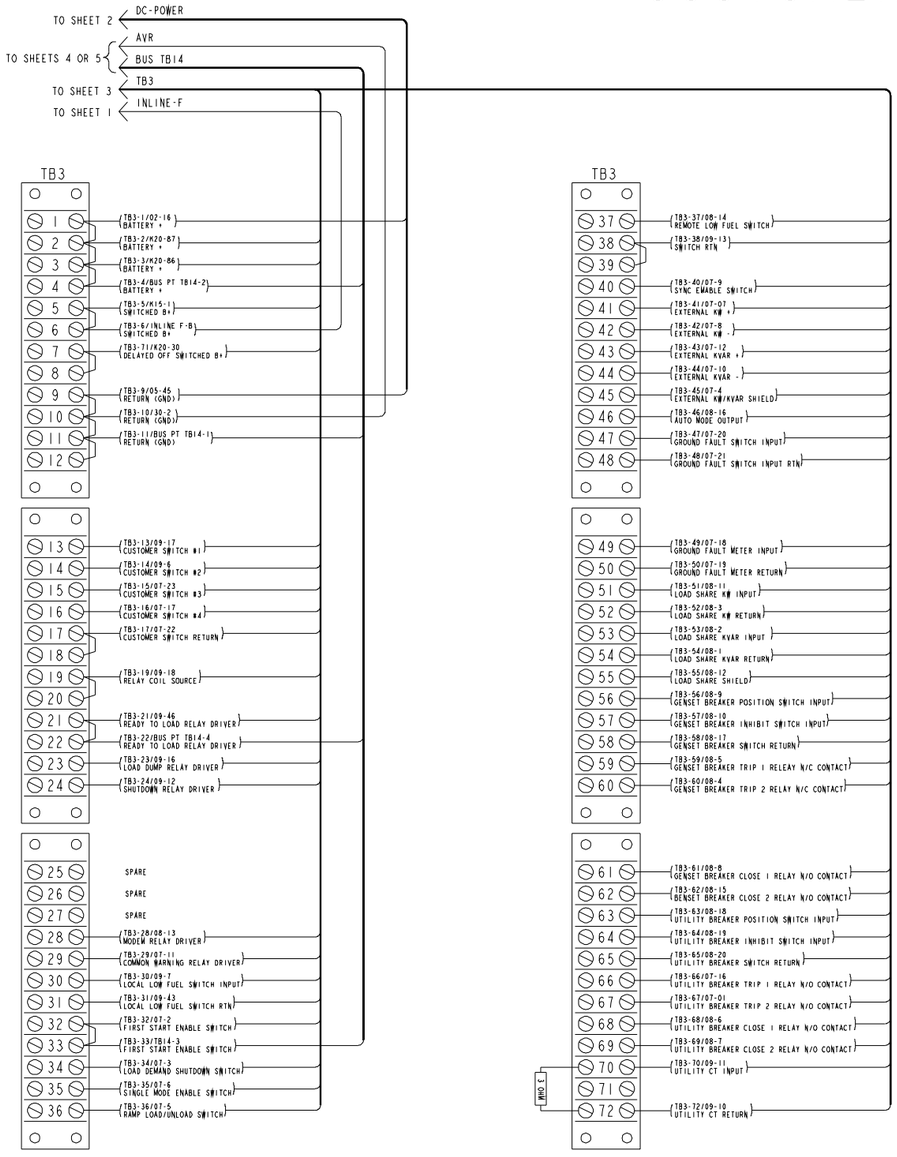
WD-INTERCONNECTION

DRG SIZE D | 0630_3210 | SHEET 4 of 7 | DRG REV B

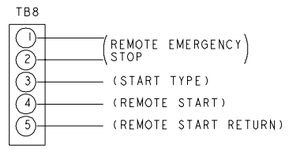
Pro/ENGINEER

REL NO	LTR	NO	REVISION	ZONE	DRN	CKD	APVD	DATE
FRD25434	A	1	PRODUCTION_RELEASE	-	LJK	LN	LN	10-26-05
FRD27825	B	--	--------	--	--	--	--	--

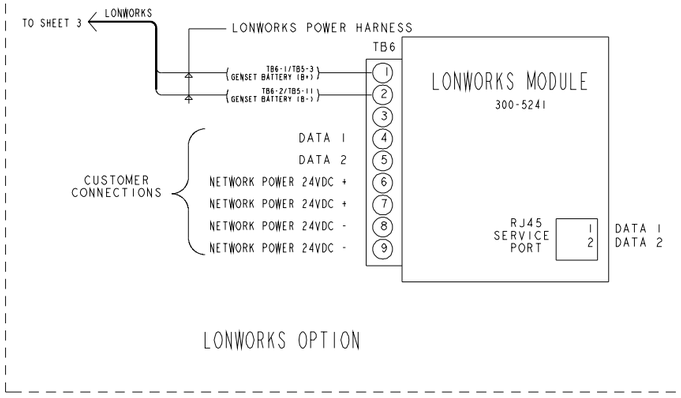
CUSTOMER CONNECTIONS


TO SHEET 2
DC-POWER
TO SHEETS 4 OR 5
AVR
BUS TB14
TO SHEET 3
TB3
TO SHEET 1
INLINE-F
TB3
1 TB3-1/02-16 BATTERY +
2 TB3-2/K20-87 BATTERY +
3 TB3-3/K20-86 BATTERY +
4 TB3-4/BUS PT TB14-2 BATTERY +
5 TB3-5/K15-1 SWITCHED B+
6 TB3-6/INLINE F-B1 SWITCHED B+
7 TB3-7/K20-30 DELAYED OFF SWITCHED B+
8
9 TB3-9/05-46 RETURN (GND)
10 TB3-10/30-2 RETURN (GND)
11 TB3-11/BUS PT TB14-1 RETURN (GND)
12
13 TB3-13/09-17 CUSTOMER SWITCH #1
14 TB3-14/09-6 CUSTOMER SWITCH #2
15 TB3-15/07-23 CUSTOMER SWITCH #3
16 TB3-16/07-17 CUSTOMER SWITCH #4
17 TB3-17/07-22 CUSTOMER SWITCH RETURN
18
19 TB3-19/09-18 RELAY COIL SOURCE
20
21 TB3-21/09-46 READY TO LOAD RELAY DRIVER
22 TB3-22/BUS PT TB14-4 READY TO LOAD RELAY DRIVER
23 TB3-23/09-16 LOAD DUMP RELAY DRIVER
24 TB3-24/09-12 SHUTDOWN RELAY DRIVER
25 SPARE
26 SPARE
27 SPARE
28 TB3-28/08-13 MODEM RELAY DRIVER
29 TB3-29/07-11 COMMON WARNING RELAY DRIVER
30 TB3-30/09-7 LOCAL LOW FUEL SWITCH INPUT
31 TB3-31/09-43 LOCAL LOW FUEL SWITCH RTN
32 TB3-32/07-2 FIRST START ENABLE SWITCH
33 TB3-33/TB14-3 FIRST START ENABLE SWITCH
34 TB3-34/07-3 LOAD DEMAND SHUTDOWN SWITCH
35 TB3-35/07-5 SINGLE MODE ENABLE SWITCH
36 TB3-36/07-5 RAMP LOAD/UNLOAD SWITCH
TB3
37 TB3-37/08-14 REMOTE LOW FUEL SWITCH
38 TB3-38/09-13 SWITCH RTN
39
40 TB3-40/07-9 SYNC ENABLE SWITCH
41 TB3-41/07-07 EXTERNAL KW +
42 TB3-42/07-8 EXTERNAL KW -
43 TB3-43/07-12 EXTERNAL KVAR +
44 TB3-44/07-10 EXTERNAL KVAR -
45 TB3-45/07-4 EXTERNAL KW/KVAR SHIELD
46 TB3-46/08-16 AUTO MODE OUTPUT
47 TB3-47/07-20 GROUND FAULT SWITCH INPUT
48 TB3-48/07-21 GROUND FAULT SWITCH INPUT RTN
49 TB3-49/07-16 GROUND FAULT METER INPUT
50 TB3-50/07-19 GROUND FAULT METER RETURN
51 TB3-51/08-11 LOAD SHARE KW INPUT
52 TB3-52/08-3 LOAD SHARE KW RETURN
53 TB3-53/08-2 LOAD SHARE KVAR INPUT
54 TB3-54/08-1 LOAD SHARE KVAR RETURN
55 TB3-55/08-12 LOAD SHARE SHIELD
56 TB3-56/08-9 GENSET BREAKER POSITION SWITCH INPUT
57 TB3-57/08-10 GENSET BREAKER INHIBIT SWITCH INPUT
58 TB3-58/08-17 GENSET BREAKER SWITCH RETURN
59 TB3-59/08-5 GENSET BREAKER TRIP 1 RELAY N/C CONTACT
60 TB3-60/08-4 GENSET BREAKER TRIP 2 RELAY N/C CONTACT
61 TB3-61/08-8 GENSET BREAKER CLOSE 1 RELAY N/O CONTACT
62 TB3-62/08-15 GENSET BREAKER CLOSE 2 RELAY N/O CONTACT
63 TB3-63/08-18 UTILITY BREAKER POSITION SWITCH INPUT
64 TB3-64/08-19 UTILITY BREAKER INHIBIT SWITCH INPUT
65 TB3-65/08-20 UTILITY BREAKER SWITCH RETURN
66 TB3-66/07-16 UTILITY BREAKER TRIP 1 RELAY N/O CONTACT
67 TB3-67/07-01 UTILITY BREAKER TRIP 2 RELAY N/O CONTACT
68 TB3-68/08-6 UTILITY BREAKER CLOSE 1 RELAY N/O CONTACT
69 TB3-69/08-7 UTILITY BREAKER CLOSE 2 RELAY N/O CONTACT
70 TB3-70/09-11 UTILITY CT INPUT
71
72 TB3-72/09-10 UTILITY CT RETURN
3 OHM

CUSTOMER CONNECTIONS ON BASE PCB



TABULATION		
TB8-	FUNCTION	DESCRIPTION
1 2	REMOTE EMERGENCY STOP	OPEN THE CONNECTION BETWEEN THESE TERMINAL POSITIONS TO INITIATE AN EMERGENCY STOP. TERMINAL POSITIONS MUST BE SHORTED TOGETHER IF REMOTE EMERGENCY STOP IS NOT USED.
3	REMOTE START TYPE	DETERMINES START TYPE: OPEN = EMERGENCY START SEQUENCE. CLOSED = NORMAL START SEQUENCE. APPLY REMOTE START RETURN (TB8-5) TO CLOSE.
4	REMOTE START	APPLY REMOTE START RETURN (TB8-5) TO REMOTE START THE GENSET.
5	REMOTE START RETURN	RETURN LINE FOR REMOTE START TYPE AND REMOTE START.



QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE
X	± 1	0.00- 4.99 +0.15/-0.08
.X	± 0.8	5.00- 9.99 +0.20/-0.10
.XX	± 0.38	10.00-17.49 +0.25/-0.13
		17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 1/1

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DRN L KAPLAN
CKD L. NAVARRETE
APVD L. NAVARRETE
DATE 10-26-05

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994

FIRST USED ON DQGAA,B

SITE CODE .

PGF

CUMMINS POWER GENERATION
1400 73RD AVENUE NE. MINNEAPOLIS, MN 55432

WD-INTERCONNECTION

DWG SIZE D | 0630_3210 | SHEET 6 of 7 | DRG REV B

Pro/ENGINEER

TABULATION TB3		
TB3-	FUNCTION	DESCRIPTION
1-4	B+	24VDC/10 AMPS BATTERY VOLTAGE SUPPLY
5-6	SWITCHED B+	24VDC/10 AMPS BATTERY VOLTAGE SUPPLY, AVAILABLE WHEN GENSET IS RUNNING
7-8	DELAYED OFF SWITCHED B+	24VDC/10 AMPS BATTERY VOLTAGE SUPPLY, AVAILABLE WHEN GENSET IS RUNNING. CONFIGURABLE DELAYED OFF IS TYPICALLY USED FOR FUEL SHUTOFF
9-12	GND	BATTERY NEGATIVE
13	CONFIGURABLE INPUT #1	CONFIGURABLE INPUT USED TO INITIATE A WARNING OR SHUTDOWN CONDITION. APPLY WITH (TB3-17/18) TO ACTIVATE
14	CONFIGURABLE INPUT #2	CONFIGURABLE INPUT USED TO INITIATE A WARNING OR SHUTDOWN CONDITION. APPLY WITH (TB3-17/18) TO ACTIVATE
15	CONFIGURABLE INPUT #3	CONFIGURABLE INPUT USED TO INITIATE A WARNING OR SHUTDOWN CONDITION. APPLY WITH (TB3-17/18) TO ACTIVATE
16	CONFIGURABLE INPUT #4	CONFIGURABLE INPUT USED TO INITIATE A WARNING OR SHUTDOWN CONDITION. APPLY WITH (TB3-17/18) TO ACTIVATE
17	CONFIGURABLE INPUT RETURN	RETURN PATH FOR CONFIGURABLE INPUTS. (TB3-13,14,15,16)
19	RELAY COIL SOURCE	SWITCHED 24VDC POWER SUPPLY. USE ON THE HIGH SIDE OF THE CUSTOMER SUPPLIED RELAY COIL IN CONJUNCTION WITH A RELAY DRIVER. PROVIDES A MINIMUM 800ma OF CURRENT
21-22	READY TO LOAD RELAY DRIVER	ACTIVATES WHEN GENSET HAS REACHED 90% OF FREQUENCY. USE ON THE LOW SIDE OF THE CUSTOMER SUPPLIED RELAY COIL IN CONJUNCTION WITH A RELAY COIL SOURCE (TB3-19/20)
23	LOAD DUMP RELAY DRIVER	ACTIVATES AT A CONFIGURABLE LOAD LEVEL OR UNDER FREQUNCY CONDITION. USE ON THE LOW SIDE OF THE CUSTOMER SUPPLIED RELAY COIL IN CONJUNCTION WITH A RELAY COIL SOURCE (TB3-19/20)
24	COMMON SHUTDOWN RELAY DRIVER	ACTIVATES ON ANY GENSET SHUTDOWN CONDITION. USE ON THE LOW SIDE OF THE CUSTOMER SUPPLIED RELAY COIL IN CONJUNCTION WITH A RELAY COIL SOURCE (TB3-19/20)
25	SPARE	
26	SPARE	
27	SPARE	
28	MODEM RELAY DRIVER	PROVIDES A CONFIGURABLE METHOD OF CONTROLLING AND CYCLING POWER TO AN EXTERNAL MODEM. USE ON THE LOW SIDE OF THE CUSTOMER SUPPLIED RELAY COIL IN CONJUNCTION WITH RELAY COIL SOURCE (TB3-19/20)
29	COMMON WARNING RELAY DRIVER	ACTIVATES ON ANY WARNING CONDITION. USE ON THE LOW SIDE OF THE CUSTOMER SUPPLIED RELAY COIL IN CONJUNCTION WITH A RELAY COIL SOURCE (TB3-19/20)
30	LOCAL LOW FUEL INPUT	PROVIDES A LOW FUEL INDICATION FOR GENSETS SUPPLIED WITH A DAY TANK OR AN INTEGRATED FUEL TANK. SWITCH RETURN WITH TB3-31
31	LOCAL LOW FUEL RETURN	SWITCH RETURN FOR LOCAL LOW FUEL INPUT (TB3-30)
32-33	FIRST START INPUT	FOR PARALLELLING APPLICATIONS, CONNECTS TO REMOTE MASTER START SENSOR OR BUS PT)MODULE WITH FIRST START SENSOR
34	LOAD DEMAND INPUT	FOR MULTIPLE GENSET PARALLEL APPLICATIONS. INPUT ALLOWS GENSET TO RAMP TO NO LOAD, OPEN BREAKER AND SHUT DOWN. REMOVING INPUT CAUSES GENSET TO START, SYNCHRONIZE, CLOSE BREAKER, AND RAMP TO LOAD. APPLY WITH SWITCH RETURN (TB3-38/39)
35	SINGLE MODE ENABLE INPUT	FOR SINGLE GENSET PARALLEL POWER TRANSFER (PLT) APPLICATIONS ONLY. APPLY WITH SWITCH RETURN (TB3-38/39) TO ENABLE MODE
36	RAMP LOAD/UNLOAD SWITCH	USED WITH MULTIPLE GENSETS IN PARALLEL IN CONJUNCTION WITH A MASTER CONTROL OR OTHER PLC DEVICE. APPLY SWITCH RETURN (TB3-38/39) TO LOAD/UNLOAD GENSET AS LOAD PROFILE DICTATES
37	REMOTE LOW FUEL INPUT	PROVIDES A LOW FUEL INDICATION FOR GENSETS THAT ARE NOT FITTED WITH AN INTEGRATED FUEL TANK. APPLY SWITCH RETURN TB3-38/39 TO ACTIVATE
38-39	SWITCH RETURN	SWITCH RETURN FOR TB3-34, 35, 36, AND 37
40	SYNC ENABLE INPUT	FOR USE IN SINGLE MODE PLT APPLICATIONS ONLY. INPUT SIGNALS GENSET TO SYNCHRONIZE WITH UTILITY
41	LOAD GOVERN KW+ INPUT	ALLOWS A REMOTE DEVICE TO CONTROL KW LOAD ON GENSET WHILE UTILITY PARALLELED. ANALOG INPUT 0-5VDC
42	LOAD GOVERN KW-	RETURN LINE LOAD GOVERN KW
43	LOAD GOVERN KVAR+ INPUT	ALLOWS A REMOTE DEVICE TO CONTROL KVAR LOAD ON GENSET WHILE UTILITY PARALLELED. ANALOG INPUT 0-5VDC. THIS INPUT IS DEFAULTED TO "DISABLED" AND IS ENABLED WITH INPOWER
44	LOAD GOVERN KVAR-	RETURN LINE LOAD GOVERN KVAR

TABULATION TB3		
TB3-	FUNCTION	DESCRIPTION
45	EXTERNAL KW/KVAR SHIELD	SHIELD TERMINATION POINT FOR LOAD GOVERN INPUTS
46	AUTO MODE OUTPUT	SWITCH BATTERY 24VDC, FUSED AT 5A. AVAILABLE WHEN GENSET IS IN AUTO MODE
47	GROUND FAULT INPUT	ACTIVATES A GROUND FAULT WARNING WHEN SWITCHED TO THE GROUND FAULT RETURN (TB3-48). USE IN CONJUNCTION WITH AN EXTERNAL GROUND FAULT RELAY
48	GROUND FAULT RETURN	RETURN LINE FOR GROUND FAULT INPUT
49	GROUND FAULT ANALOG INPUT	FUTURE FEATURE
50	GROUND FAULT METER RETURN	RETURN LINE FOR GROUND FAULT ANALOG INPUT
51	LOAD SHARE KW+	FOR ISOLATED BUS PARALLELING ONLY. KW LOAD SHARING LINES FOR POWER COMMAND GENSETS
52	LOAD SHARE KW-	RETURN FOR LOAD SHARE KW
53	LOAD SHARE KVAR+	FOR ISOLATED BUS PARALLELING ONLY. KVAR LOAD SHARING LINES FOR POWER COMMAND GENSETS
54	LOAD SHARE KVAR+	RETURN FOR LOAD SHARE KVAR
55	LOAD SHARE SHIELD	SHIELD TERMINATION POINT FOR LOAD SHARE KW AND LOAD SHARE KVAR LINES
56	GENSET BREAKER POSITION SWITCH INPUT	FOR PARALLELING AND POWER TRANSFER CONTROL APPLICATIONS. WHEN CLOSED INDICATES TO CONTROL THAT GENSET BREAKER IS CLOSED. USE WITH GENSET BREAKER SWITCH RETURN (TB3-58)
57	GENSET BREAKER INHIBIT SWITCH INPUT	FOR PARALLELING APPLICATIONS. WHEN CLOSED TO GENSET BREAKER SWITCH RETURN (TB3-50), GENSET BREAKER WILL OPEN, OR BE PREVENTED FROM CLOSING
58	GENSET BREAKER SWITCH RETURN	RETURN LINE FOR TB3-56/57
59	GENSET BREAKER OPEN COMMAND	FOR USE IN PARALLELING AND POWER TRANSFER CONTROL APPLICATIONS. NORMALLY CLOSED CONTACT THAT OPENS TO OPEN GENSET BREAKER. USE WITH TB3-60
60	GENSET BREAKER OPEN COMMAND RETURN	USE WITH TB3-59
61	GENSET BREAKER CLOSE COMMAND	FOR USE IN PARALLELING AND POWER TRANSFER CONTROL APPLICATIONS. NORMALLY OPEN CONTACT THAT CLOSES TO CLOSE GENSET BREAKER. USE WITH TB3-62
62	GENSET BREAKER CLOSE COMMAND RETURN	USE WITH TB3-61
63	UTILITY BREAKER POSITION INPUT	FOR POWER TRANSFER CONTROL APPLICATIONS. WHEN CLOSED INDICATES TO CONTROL THAT UTILITY BREAKER IS CLOSED. USE WITH UTILITY BREAKER RETURN (TB3-65)
64	UTILITY BREAKER INHIBIT INPUT	FOR POWER TRANSFER CONTROL APPLICATIONS. WHEN CLOSED TO UTILITY BREAKER RETURN (TB3-65), UTILITY BREAKER WILL OPEN, OR BE PREVENTED FROM CLOSING
65	UTILITY BREAKER RETURN	USE WITH TB3-63/64
66	UTILITY BREAKER OPEN COMMAND	FOR POWER TRANSFER CONTROL APPLICATIONS. NORMALLY CLOSED CONTACT THAT OPENS TO OPEN UTILITY BREAKER. USE WITH TB3-67
67	UTILITY BREAKER OPEN COMMAND RETURN	USE WITH TB3-66
68	UTILITY BREAKER CLOSE COMMAND	FOR POWER TRANSFER CONTROL APPLICATIONS. NORMALLY OPEN CONTACT THAT CLOSES TO CLOSE UTILITY BREAKER. USE WITH TB3-69
69	UTILITY BREAKER CLOSE COMMAND RETURN	USE WITH TB3-68
70	SYSTEM LOAD INPUT	FOR POWER TRANSFER CONTROL APPLICATIONS. ACCEPTS CT INPUT FOR MONITORING B PHASE CURRENT ON THE UTILITY BUS. USE UTILITY CT RETURN (TB3-72). A 3 OHM BURDEN RESISTOR IS CONNECTED ACROSS TB3-70 AND TB3-72
71	SPARE	
72	SYSTEM LOAD RETURN	USE WITH TB3-70

CUSTOMER CONNECTIONS (DESCRIPTIONS)

REL NO	LTR	NO	REVISION	ZONE	DRN	CKD	APVD	DATE
FRD25434	A	1	PRODUCTION_RELEASE	-	LJK	LN	LN	10-26-05
FRD27825	B	--	--------	--	--	--	--	--

QTY | ITEM | PART NO | DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM: X ± 1; .X ± 0.8; .XX± 0.38

HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° | SCALE: 1/1

SW to . | DO NOT SCALE PRINT

- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP

DRN L KAPLAN | CKD L. NAVARRETE | APVD L. NAVARRETE | DATE 10-26-05

FOR INTERPRETATION OF DIMENSIONS AND TOLERANCES, SEE ASME Y14.5M-1994 | FIRST USED ON DQGAA,B

SITE CODE PGF

CUMMINS POWER GENERATION
1400 73RD AVENUE NE, MINNEAPOLIS, MN 55432

WD-INTERCONNECTION

DRG SIZE D | 0630_3210 | SHEET 7 of 7 | DRG REV B

Pro/ENGINEER

Pro/ENGINEER

REL NO	LTR	NO	REVISION	DWN	CKD	APVD	DATE
ECO-103803	F	1	ADD DRW NOTE 4	AL	DPA	I.VPLETY	21APR09

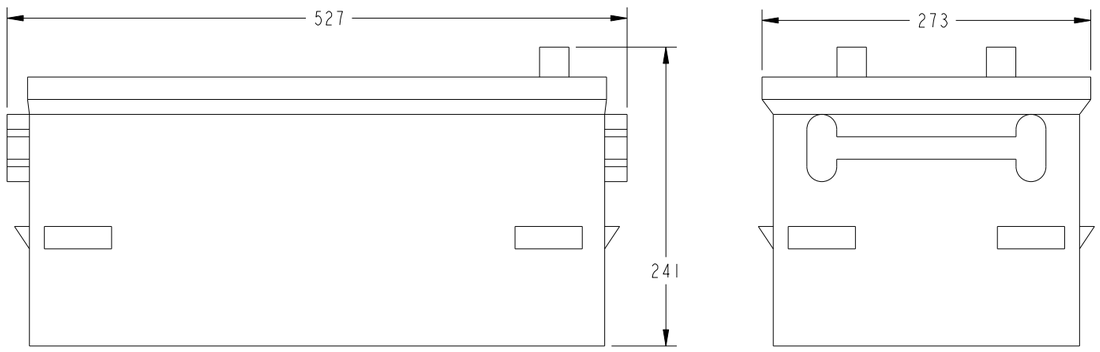
NOTES:

1. SPECIFICATIONS:
   VOLTAGE - - - - - - - - - - - - - - - - - 12
   GROUP - - - - - - - - - - - - - - - - - - 8D
   BATTERY CONDITION - - - - - - - - - - DRY
   CRANKING PERFORMANCE: 1400 CCA @ 0°F
   RESERVE CAPACITY: 430 MINUTES

2. THIS PART IS MANUFACTURER SOURCE CONTROLLED.

3. A FILLING/CHARGING INSTRUCTION SHEET SHALL BE ATTACHED TO THE BATTERY

4. SEE THE MSDS FOR FURTHER INFORMATION REGARDING THE HAZARDS OF THIS PRODUCT.



-THIS IS A CONTROLLED PRODUCT-
PER ONAN PROCEDURE FRE-1002

TO MAINTAIN COMPLIANCE WITH REQUIREMENTS OF THE CODES, STANDARDS, OR AGENCIES LISTED BELOW

☐ CSA ☒ UL ☐ EC ☐ RVIA ☐ ABYC
☐ OTHER _____ ☐ OTHER _____

AND/OR ASSIGN INTERNAL ONAN DESIGN CONTROL FACILITIES ☐

CHANGES, DEVIATIONS, OR SUBSTITUTIONS OF MATERIAL, PROCESS, OR PERFORMANCE FOR THIS PRODUCT MUST BE APPROVED BY THE FOLLOWING DESIGN CONTROL FACILITIES

DESIGN CONTROL FACILITY FRIDLEY
DESIGN CONTROL FACILITY _____

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE
X	± 1	0.00- 4.99 +0.15/-0.08
.X	± 0.8	5.00- 9.99 +0.20/-0.10
.XX	± 0.38	10.00-17.49 +0.25/-0.13
		17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 11/32

SIM TO .
DO NOT SCALE PRINT
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DWN G W HUEBNER
CKD B GROSS
APVD B GROSS
DATE 11-09-06
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994
FIRST USED ON GENERAL

SITE CODE PGF

CUMMINS POWER GENERATION

BATTERY
.

DWG SIZE C | 0416_0439 | SHEET 1 OF 1 | DWG REV F

Four-stage battery charger

12 amp @ 24 volt

> Specification sheet

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Description

Cummins Power Generation fully automatic battery chargers - using switched mode power electronics - are constant voltage/constant current chargers incorporating a 4-stage charging algorithm. Designed for use in applications where battery life and reliability are important; these chargers, complete with built-in equalize charge capability, are ideal for stationary or portable starting battery charging service.

To achieve optimum battery life, a 4-stage charging cycle is implemented. The four charging stages are trickle, bulk, absorption and float. The trickle stage safely charges overly discharged batteries. It protects a damaged or shorted battery from excessive current. During bulk charge a constant current is applied to quickly restore the maximum battery charge level in the shortest amount of time. The absorption stage applies a constant voltage to the battery to bring the battery to 100% capacity. The float stage tailors the constant voltage output to maintain the battery at full capacity while serving DC operated loads.

An optional temperature sensor may be used to adjust charging rate based on internal battery temperature in the absorption and float stages. Use of a battery temperature sensor helps to increase battery life by preventing over or under charging of the battery. The battery temperature sensor also protects the battery from overheating. Temperature compensation is recommended in all applications, but is particularly valuable for generator sets in outdoor applications.

Battery chargers are field-configurable for charging either 12 or 24 VDC battery systems and for operation at 50 or 60 Hz. Output voltage and battery type selection is done through the alphanumeric display.

Features

Protection - All models include a 20 amp DC output breaker. Re-settable breakers are used for input voltages 240 VAC and lower. For over 240 VAC branch circuit rated fuses are used.

Easy installation - Clearly marked terminal blocks and panel knockouts provide convenient connections of input and output leads.

User display - Output voltage and current, fault information and configuration options are indicated on the alphanumeric display.

Monitoring - An LED indicates the condition of the charger. Green indicates normal charging operation, amber indicates equalizing and red indicates a fault condition.

Adjustable float voltage – Float voltage can be set through the alpha-numeric display for optimum battery performance and life.

Temperature compensation - An optional external sensor is available for temperature compensated battery charging.

Faults - The charger senses and annunciates the following fault conditions: Input overvoltage, input undervoltage, AC power loss, battery overvoltage, battery undervoltage, charger circuitry over temperature, battery over temperature, unrecoverable battery and overload/overcurrent. Includes 30 volt/2 amp isolated contact for common alarm.

Parallel redundant operation - Chargers can be operated in parallel for redundant reliability or additional charging capacity.

Vibration resistant design - complies with UL 991 vibration resistance requirements.

UL 1236 (BBHH) Listing - for use with lead acid batteries in generator set installations. Also suitable for use with NiCad, gel and AGM batteries.

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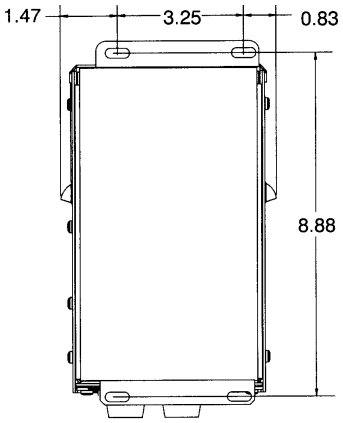
Specifications

Performance and physical characteristics

Output:	Nominal voltage	12 or 24 VDC
	Float voltage – 12 V batteries	12.8, 13.0, 13.3, 13.5, 13.6, 14.3
	Float voltage – 24 V batteries	25.7, 26.1, 26.6, 27.0, 27.2, 28.6
	Equalize-voltage	15.5 or 31.0 VDC
	Output voltage regulation	±1%
	Maximum output current	15 A @ 12 VDC or 12 A @ 24 VDC
	Equalize charger time	0-12 hrs
Input:	Voltage AC	120, 208, 240, 277, 380, 416, 480, 600
	Frequency	50 or 60 Hz
Approximate net weights:		11.6 lbs (5.3 Kg)
Approximate dimensions: height x width x depth - in (mm)		9.75 x 5.56 x 6.14 (248 x 141 x 156)
Ambient temperature operation:		-22 °F to 122 °F (-30 °C to 50 °C)

Input volts	Genset kit part number	ATS kit part number
120/208/240	0300-5878-01	0300-5878-13
277	0300-5878-02	0300-5878-14
380	0300-5878-03	0300-5878-15
416	0300-5878-04	0300-5878-16
480	0300-5878-05	0300-5878-17
600	0300-5878-06	0300-5878-18
Temperature sensor kit	0541-0918	0541-0918



Mounting dimensions – inches
Bottom view

Enclosure

The NEMA 1, corrosion resistant, aluminum enclosure is designed for wall mounting. When wall mounted, louvers protect cooling holes in the sides of the enclosure. Use 1/4 in (6.35 mm) diameter bolts for mounting.

RFI/EMI and voltage surge compliance

Charger complies with the requirements of EN61000-4-5 for voltage surge resistance, EN50082-2 (heavy industrial) for immunity, EN61000-4-2 for ESD, EN61000-4-3 for radiated immunity, ANSI/IEEE C62.41 Category B & EN 61000-4-4 for electrically fast transient, EN61000-4-6 for conducted, and FCC Part 15 Class A for emissions.

Americas
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574 5000
Fax: 763 574 5298

Europe, CIS, Middle East and Africa
Manston Park Columbus Ave.
Manston Ramsgate
Kent CT 12 5BF United Kingdom
Phone 44 1843 255000
Fax 44 1843 255902

Asia Pacific
10 Toh Guan Road #07-01
TT International Tradepark
Singapore 608838
Phone 65 6417 2388
Fax 65 6417 2399

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect generator sets to any building electrical system except through an approved device or after building main switch is open.

Warning: For professional use only. Must be installed by a qualified service technician. Improper installation presents hazards of electrical shock and improper operation, resulting in severe personal injury and/or property damage.

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Transfer switch OTEC open transition

800 Amp, 4 Pole, 480 VAC

> Specification sheet
40 - 1200 Amp

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Description

OTEC transfer switches are designed for operation and switching of electrical loads between primary power and standby generator sets. They are suitable for use in emergency, legally required, and optional standby applications. The switches monitor both power sources, signal generator set startup, automatically transfer power, and return the load to the primary power source once a stable utility is available.

The fully integrated controller is designed for practical functionality, with LED indicators and digital pushbuttons for ease of operator use.

UL	All switches are UL 1008 Listed with UL Type Rated cabinets and UL Listed CU-AL terminals.
CSA	All switches are certified to CSA 282 Emergency Electrical Power Supply for Buildings, up to 600 VAC.
NEC	Equipment shall be suitable for use in systems compliant to 700, 701 and 702.
NFPA	All switches comply with NFPA 70, 99 and 110.
NEMA	All switches comply with NEMA ICS 10.
IEEE	All switches comply with IEEE 446 Recommended Practice for Emergency and Standby Power Systems.
ISO 9001	This transfer switch is designed and manufactured in facilities certified to ISO9001.

Features

Microprocessor control - Easy-to-use, standard control. LEDs display transfer switch status; pushbuttons allow operator to activate control test, exercise timing and transfer mode.

Programmed transition – Open transition timing can be adjusted to completely disconnect the load from both sources for a programmed time period, as recommended by NEMA MG-1 for transfer of inductive loads.

Advanced transfer switch mechanism - Unique bi-directional linear actuator provides virtually friction-free, constant force, straight-line transfer switch action during automatic operation.

Manual operation - Manual operating handles, shielded termination, and over-center contact mechanisms allow effective manual operation under de-energized conditions.

Positive interlocking - Mechanical and electrical interlocking prevent source-to-source connection through the power or control wiring.

Main contacts - Heavy-duty silver alloy contacts with multi-leaf arc chutes are rated for 100% load interruption. They require no routine contact maintenance and provide 100% continuous current ratings.

Easy service/access - Single-plug harness connection and compatible terminal markings simplify servicing. Access space is ample. Door-mounted controls are field-programmable; no tool is required.

Complete product line - Cummins Power Generation offers a wide range of equipment, accessories and services to suit virtually any backup power application.

Warranty and service - Products are backed by a comprehensive warranty and a worldwide network of distributors with factory-trained service technicians.

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S-1464n (7/10)

Transfer switch mechanism

- Transfer switch mechanism is electrically operated and mechanically held in the Source 1 and Source 2 positions. The transfer switch incorporates electrical and mechanical interlocks to prevent inadvertent interconnection of the sources.
- Independent break-before-make action is used for both 3-pole and 4-pole/switched neutral switches. This design allows use of sync check operation when required, or control of the operating speed of the transfer switch for proper transfer of motor and rectifier-based loads (programmed transition feature).
- True 4-pole switching allows for proper ground (earth) fault sensing and consistent, reliable operation for the life of the transfer switch. The neutral poles of the transfer switch have the same ratings as the phase poles and are operated by a common crossbar mechanism, eliminating the possibility of incorrect neutral operation at any point in the operating cycle, or due to failure of a neutral operator.
- Electrical interlocks prevent simultaneous closing signals to normal and emergency contacts and interconnection of normal and emergency sources through the control wiring.
- High pressure silver alloy contacts resist burning and pitting. Separate arcing surfaces further protect the main contacts. Contact wear is reduced by multiple leaf arc chutes that cool and quench the arcs. Barriers separate the phases to prevent interphase flashover. A transparent protective cover allows visual inspection while inhibiting inadvertent contact with energized components.
- Switch mechanism, including contact assemblies, is third-party certified to verify suitability for applications requiring high endurance switching capability for the life of the transfer switch. Withstand and closing ratings are validated using the same set of contacts, further demonstrating the robust nature of the design.

Specifications

Voltage rating	Transfer switches rated from 40 A through 1200 A are rated up to 600 VAC, 50 or 60 Hz.
Arc interruption	Multiple leaf arc chutes cool and quench the arcs. Barriers prevent interphase flashover.
Neutral bar	A full current-rated neutral bar with lugs is standard on enclosed 3-pole transfer switches.
Auxiliary contacts	Two contacts (one for each source) are provided for customer use. Wired to terminal block for easy access. Rated at 10A continuous and 250 VAC maximum.
Operating temperature	-22 °F (-30 °C) to 140 °F (60 °C)
Storage temperature	-40 °F (-40 °C) to 140 °F (60 °C)
Humidity	Up to 95% relative, non-condensing
Altitude	Up to 10,000 ft (3,000 m) without derating
Total transfer time (source-to-source)	Will not exceed 6 cycles at 60 Hz with normal voltage applied to the actuator and without delayed transition enabled.
Manual operation handles	Transfer switches are equipped with permanently attached operating handles and quick-break, quick-make contact mechanisms suitable for manual operation under de-energized conditions.

Open transition/programmed – Controls the time required for the device to switch from source to source, so that the load-generated voltages decay to a safe level before connecting to an energized source. Recommended by NEMA MG-1 to prevent nuisance tripping breakers and load damage. Adjustable 0-60 seconds, default 0 seconds.

Open transition/in-phase – Initiates open transition transfer when in-phase monitor senses both sources are in phase. Operates in a break-before-make sequence. Includes ability to enable programmed transition as a backup. If sources are not in phase within 120 seconds, the system will transfer using programmed transition.

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Microprocessor control

- Simple, easy-to-use control provides transfer switch information and operator controls
- LED lamps for source availability and source connected indication, exercise mode, and test mode. LED status lamps also provided for control set-up and configuration.
- Pushbutton controls for initiating test, overriding time delays and setting exercise time.
- Field-configurable for in-phase open or programmed open transition.
- Integral exerciser clock
- Control is prototype-tested to withstand voltage surges per EN 60947-6-1.
- Gold-flashed generator start contacts

Control functions

Voltage sensing: All phases on the normal source and single phase on generator source. Normal Source Pickup: adjustable 90-95%, Dropout: adjustable 70-90% of nominal voltage; Generator Source Pickup: 90%, dropout: 75% of nominal voltage.

Frequency sensing: Generator Source Pickup: 90% of nominal frequency; Dropout: 75% of nominal frequency.

Exerciser clock: Switch is furnished with an integral engine exerciser configurable for operation on a 7, 14, 21, or 28-day cycle with a fixed exercise period duration of 20 minutes. A 12-hr exerciser time offset allows for the convenient setting of exercise time without the need to activate the timer at the exact time that you need to schedule the generator exercise for. Software selectable capability allows for the exercising of the generator with or without load.

Time-delay functions

Engine start: Prevents nuisance genset starts due to momentary power system variation or loss. Adjustable: 0-10 seconds; default: 3 seconds.

Transfer normal to emergency: Allows genset to stabilize before application of load. Prevents power interruption if normal source variation or loss is momentary. Allows staggered transfer of loads in multiple transfer switch systems. Adjustable 0-300 seconds, default 5 seconds.

Retransfer emergency to normal: Allows the utility to stabilize before retransfer of load. Prevents needless power interruption if return of normal source is momentary. Allows staggered transfer of loads in multiple transfer switch systems. Adjustable 0-30 minutes, default 10 minutes.

Genset stop: Maintains availability of the genset for immediate reconnection in the event that the normal source fails shortly after transfer. Allows gradual genset cool down by running unloaded. Adjustable 0-30 minutes, default 10 minutes.

Delayed (programmed) transition: Controls the speed of operation of the transfer switch power contacts to allow load generated voltages from inductive devices to decay prior to connecting a live source. Adjustable 0-10 seconds, default 0 seconds.

Elevator signal: Provides a relay output contact for the elevator signal relay (load disconnect). The signal can also be configured to provide a post transfer delay of the same duration. Adjustable: 0-300 seconds (requires optional elevator signal relay for use).

Options

Elevator signal relay: Provides a relay output contact for the signal relay function

Programmable exerciser clock: Provides a fully-programmable 7-day clock to provide greater flexibility in scheduling exercise periods than standard integral exerciser. Time-of-day setting feature operates generator during periods of high utility rates.

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UL withstand and closing ratings

The transfer switches listed below must be protected by circuit breakers or fuses. Referenced drawings include detailed listings of specific breakers or fuse types that must be used with the respective transfer switches. Consult with your distributor/dealer to obtain the necessary drawings. Withstand and Closing Ratings (WCR) are stated in symmetrical RMS amperes.

	MCCB protection			Special circuit breaker protection		
Transfer switch ampere	**WCR at volts max with specific manufacturers MCCBs**	**Max MCCB rating**	**Drawing reference**	**With specific current limiting breakers (CLB)**	**Max CLB rating**	**Drawing reference**
40, 70, 125 3-pole	14,000 at 600	225 A	098-6885	200,000 @ 600	225 A	098-6918
40, 70, 125 4-pole	30,000 at 600	225 A	098-6885	200,000 @ 600	225 A	098-6918
150, 225, 260	30,000 at 600	400 A	098-6886	200,000 @ 600	400 A	098-6919
300, 400, 600	65,000 at 600	1200 A	098-6887	200,000 @ 600	1200 A	098-6920
800, 1000	65,000 at 480 50,000 at 600	1400 A	098-6888	200,000 @ 600	1400 A	098-6921
1200	85,000 at 480 65,000 at 600	1600 A	A030U183	200,000 @ 600	1600 A	A030U185

Fuse protection

Transfer switch ampere	**WCR at volts max. with current limiting fuses**	**Max fuse, size and type**	**Drawing reference**
40, 70, 125 3- and 4-pole	200,000 at 600	200 A Class, J, RK1, RK5, T	098-6885
150, 225, 260	200,000 at 600	1200 A Class L or T, or 600 A class J, RK1, RK5	098-6886
300, 400, 600	200,000 at 600	1200 A Class L or T, or 600 A Class, J, RK1, RK5	098-6887
800, 1000	200,000 at 600	2000 A Class L or 1200 A class T or 600 A class J, RK1, RK5	098-6888
1200	200,000 at 600	2000 A Class L or 1200 A class T or 600 A class J, RK1, RK5	A030U183

3-cycle ratings

Transfer switch ampere	**WCR at volts max 3-cycle rating**	**Max MCCB rating**	**Drawing reference**
1200	42,000 at 600	2000 amps	A030U183

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Power Generation

Enclosures

The transfer switch and control are wall-mounted in a key-locking enclosure. Wire bend space complies with 2008 NEC.

Dimensions - transfer switch in UL type 1 enclosure

	Height		Width		Depth				Weight		Outline drawing
					Door closed		Door open				
Amp rating	in	mm	in	mm	in	mm	in	mm	lb	kg	
40, 70, 125 3-pole	27.0	686	20.5	521	12.0	305	31.5	800	82	37	0310-0544
40, 70, 125 4-pole	35.5	902	26.0	660	16.0	406	41.0	1042	165	75	0500-4896
150, 225	35.5	902	26.0	660	16.0	406	41.0	1042	165	75	0310-0414
260	43.5	1105	28.5	724	16.0	406	43.0	1093	170	77	0310-0540
300, 400, 600	54.0	1372	25.5	648	18.0	457	42.0	1067	225	102	0310-1307
800, 1000	68.0	1727	30.0	762	19.5	495	48.5	1232	360	163	0310-0417
1200	90.0	2286	39.0	991	27.0	698	63.0	1600	730	331	A030L411

Dimensions - transfer switch in UL type 3R, 4, 4X, or 12 enclosure

	Height		Width		Depth				Weight		Cabinet type	Outline drawing
					Door closed		Door open					
Amp rating	in	mm	in	mm	in	mm	in	mm	lb	kg		
40, 70, 125 3-pole	34.0	864	26.5	673	12.5	318	36.5	927	125	57	3R, 12	0310-0453
											4	0310-0445
	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	4X	0500-4184
40, 70, 125 4-pole	42.5	1080	30.5	775	16.0	406	44.0	1118	215	97	3R, 12	0500-4896
											4	0500-4896
	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	4X	0500-4184
150, 225	42.5	1080	30.5	775	16.0	406	44.0	1118	215	97	3R, 12	0310-0454
											4	0310-0446
	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	4X	0500-4184
260	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	3R, 12	0310-0455
											4	0310-0447
											4X	0500-4184
300, 400, 600	59.0	1499	27.5	699	16.5	419	41.5	1054	275	125	3R, 12	0310-1315
											4	0310-1316
	73.5	1867	32.5	826	19.5	495	49.5	1257	410	186	4X	0500-4185
800, 1000	73.5	1867	32.5	826	19.5	495	49.5	1257	410	186	3R, 12	0310-0457
											4	0310-0449
											4X	0500-4185
1200	90.0	2286	39.0	991	27.0	698	63.0	1600	730	331	3R, 12, 4, 4X	A030L411

Transfer switch lug capacities

All lugs accept copper or aluminum wire unless indicated otherwise.

Transfer switch ampere	Cables per phase	Size
40, 70, 125 3-pole	1	#12 AWG-2/0
40 4-pole	1	#12 AWG-2/0
70, 125 4-pole	1	#6 AWG - 300 MCM
150, 225	1	#6 AWG - 300 MCM
260	1	#6 AWG - 400 MCM
300, 400	1	3/0 - 600 MCM
300, 400	2	3/0 - 250 MCM
600	2	250 - 500 MCM
800	4	250 - 500 MCM
1000,1200	4	#2 AWG-750 MCM

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S-1464n (7/10)

Power Generation

Submittal detail

Amperage ratings
- ☐ 40
- ☐ 70
- ☐ 125
- ☐ 150
- ☐ 225
- ☐ 260
- ☐ 300
- ☐ 400
- ☐ 600
- ☑ 800
- ☐ 1000
- ☐ 1200

Voltage ratings
- ☐ R020 120
- ☐ R038 190
- ☐ R021 208
- ☐ R022 220
- ☐ R023 240
- ☐ R024 380
- ☐ R025 416
- ☐ R035 440
- ☑ R026 480
- ☐ R027 600

Pole configuration
- ☐ A028 Poles - 3 (solid neutral)
- ☑ A029 Poles - 4 (switched neutral)

Frequency
- ☑ A044 60 Hertz
- ☐ A045 50 Hertz

Application
- ☑ A035 Utility to genset

System options
- ☐ A041 Single phase, 2-wire or 3-wire
- ☑ A042 Three phase, 3-wire or 4-wire

Enclosure
- ☐ B002 Type 3R: intended for outdoor use, provides some protection from dirt, rain and snow (similar to IEC Type IP34)
- ☐ B003 Type 4: indoor or outdoor use, provides some protection from wind-blown dust and water spary (similar to IEC Type IP65)
- ☐ B010 Type 12: indoor use, some protection from dust (similar to IEC Type IP61)
- ☐ B025 Type 4X: stainless steel, indoor or outdoor use, provides some protection from corrosion (similar to IEC Type IP65)

Standards
- ☑ A046 UL 1008/CSA certification
- ☐ A080 Seismic certification

Control voltage
- ☐ M033 12V, Genset starting voltage
- ☑ M034 24V, Genset starting voltage

Control options
- ☑ J030 External exercise clock
- ☑ M032 Elevator signal relay

Battery chargers
- ☐ K001 2 amps, 12/24 volts
- ☐ KB59 15 amps, 12 volts
- ☐ KB60 12 amps, 24 volts

Auxiliary relays

Relays are UL Listed and factory installed. All relays provide (2) normally closed isolated contacts rated 10 A @ 600 VAC. Relay terminals accept (1) 18 gauge to (2) 12 gauge wires per terminal.

- ☐ L101 24 VDC coil - installed, not wired (for customer use).
- ☐ L102 24 VDC coil - emergency position - relay energized when switch is in source 2 (emergency) position.
- ☐ L103 24 VDC coil - normal position - relay energized when switch is in source 1 (normal) position
- ☐ L201 12 VDC coil installed, not wired (for customer use)
- ☐ L202 12 VDC coil - emergency position - relay energized when switch is in source 2 (emergency) position
- ☐ L203 12 VDC coil - normal position - relay energized when switch is in source 1 (normal) position

Miscellaneous options
- ☑ C027 Cover - guard
- ☐ M003 Terminal block - 30 points (not wired)

Optional lug kits
- ☐ N032 Lug adapters, compression, ½ stab
- ☐ N045 Cable lugs, mechanical, 600 MCM, 4 per pole
- ☐ N066 Cable lugs, mechanical, 750 MCM, 4 per pole

Warranty
- ☐ G009 1 year comprehensive
- ☐ G004 2 year comprehensive
- ☐ G006 5 year basic
- ☑ G007 5 year comprehensive
- ☐ G008 10 year major components

Shipping
- ☐ A051 Packing - export box (800-1000 A)

Accessories
- ☐ AC-170 Accessories specifications sheet

Cummins Power Generation

Americas
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574 5000
Fax: 763 574 5298

Europe, CIS, Middle East and Africa
Manston Park Columbus Ave.
Manston Ramsgate
Kent CT 12 5BF United Kingdom
Phone 44 1843 255000
Fax 44 1843 255902

Asia Pacific
10 Toh Guan Road #07-01
TT International Tradepark
Singapore 608838
Phone 65 6417 2388
Fax 65 6417 2399

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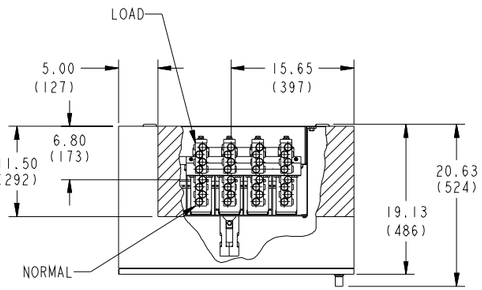
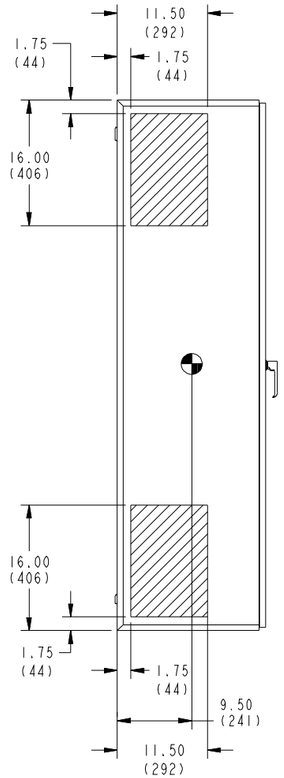
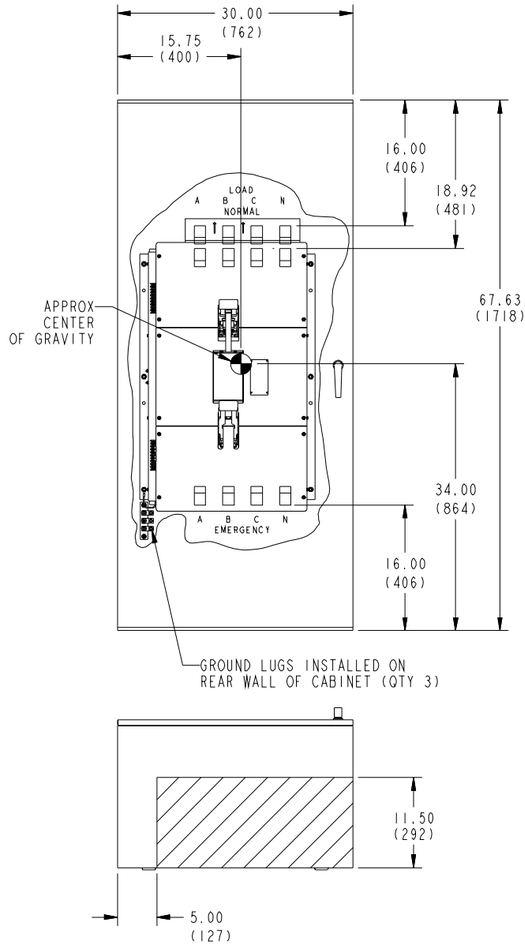
S-1464n (7/10)

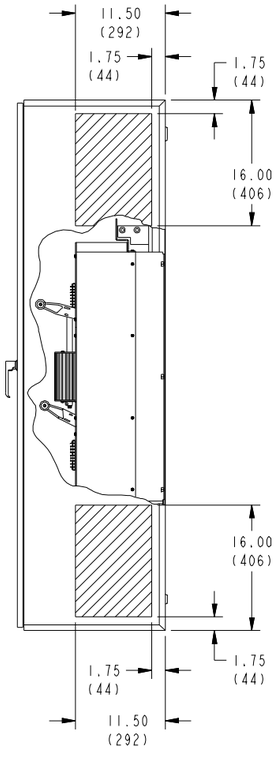
Power Generation

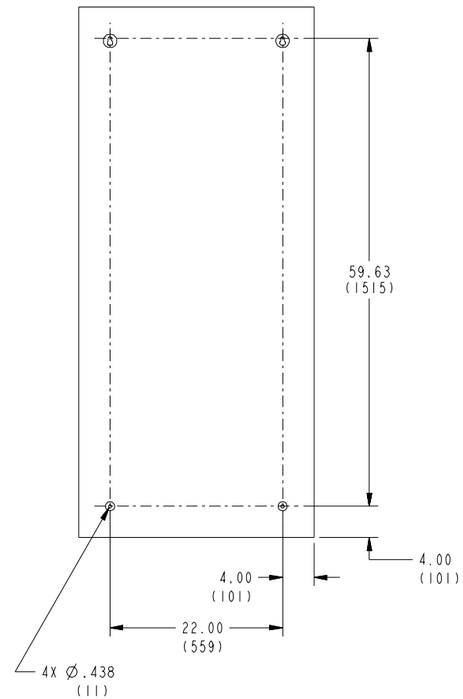
REL NO	LTR	NO	REVISION	ZONE	DRN	CKD	APVD	DATE
FRD31376	G	1	REDRAWN ON PROE	-	GJT	BG	L.SMITH	03-16-07
		3	NOTE 7: 110.26 WAS 110-16	2B	GJT	BG	L.SMITH	03-16-07
		5	NOTE 6: 312.6 WAS 373-6	2B	GJT	BG	L.SMITH	03-16-07











NOTES:

1. APPROX. WEIGHT: 360 LBS
   MASS: 163 kg
2. DIMENSIONS IN ( ) ARE MILLIMETRES.
3. LUG CAPACITY:
   (QUANTITY 4 WIRES) 250-500 (120-240) MCM CU-AL.
   GND LUG CAPACITY:(1 WIRE)
   WIRE RANGE #6-250 (16-120) MCM CU-AL.
4. USE SEPARATE CONDUITS FOR CONTROL WIRING AND POWER WIRING. DO NOT COMBINE.
5. SHADED AREA INDICATES WIRING AND CABLE ENTRANCE AREA, DO NOT INSTALL OUTSIDE OF SHADED AREA.
6. WIRE BENDING SPACE CONFORMS TO NEC TABLE 312.6 (B).
7. REFER TO NATIONAL ELECTRIC CODE, ARTICLE 110.26 WHICH STATES THE REQUIREMENT FOR THE MINIMUM CLEAR SPACE IN FRONT OF THIS UNIT.

4 POLE

QTY	ITEM	PART NO	DESCRIPTION OR MATERIAL

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM: X ±1, .X ±0.8, .XX± 0.38
HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 1/1

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DO NOT SCALE PRINT

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DRN G. THOMAS
CKD B. GROSS
APVD L. SMITH
DATE 03-16-07

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994

FIRST USED ON 800-1000 AMP

Cummins

CUMMINS POWER GENERATION
1400 73RD AVENUE NE. MINNEAPOLIS, MN 55432

OUTLINE-CONTROL BOX

SITE CODE .

PGF

DWG SIZE D | 0310_0417 | SHEET 2 of 2 | DRG REV G

Pro/ENGINEER

Transfer switch OTEC open transition

600 Amp, 3 Pole, 480 VAC

> Specification sheet
40 - 1200 Amp

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Description

OTEC transfer switches are designed for operation and switching of electrical loads between primary power and standby generator sets. They are suitable for use in emergency, legally required, and optional standby applications. The switches monitor both power sources, signal generator set startup, automatically transfer power, and return the load to the primary power source once a stable utility is available.

The fully integrated controller is designed for practical functionality, with LED indicators and digital pushbuttons for ease of operator use.

UL	All switches are UL 1008 Listed with UL Type Rated cabinets and UL Listed CU-AL terminals.
CSA	All switches are certified to CSA 282 Emergency Electrical Power Supply for Buildings, up to 600 VAC.
NEC	Equipment shall be suitable for use in systems compliant to 700, 701 and 702.
NFPA	All switches comply with NFPA 70, 99 and 110.
NEMA	All switches comply with NEMA ICS 10.
IEEE	All switches comply with IEEE 446 Recommended Practice for Emergency and Standby Power Systems.
ISO 9001	This transfer switch is designed and manufactured in facilities certified to ISO9001.

Features

Microprocessor control - Easy-to-use, standard control. LEDs display transfer switch status; pushbuttons allow operator to activate control test, exercise timing and transfer mode.

Programmed transition – Open transition timing can be adjusted to completely disconnect the load from both sources for a programmed time period, as recommended by NEMA MG-1 for transfer of inductive loads.

Advanced transfer switch mechanism - Unique bi-directional linear actuator provides virtually friction-free, constant force, straight-line transfer switch action during automatic operation.

Manual operation - Manual operating handles, shielded termination, and over-center contact mechanisms allow effective manual operation under de-energized conditions.

Positive interlocking - Mechanical and electrical interlocking prevent source-to-source connection through the power or control wiring.

Main contacts - Heavy-duty silver alloy contacts with multi-leaf arc chutes are rated for 100% load interruption. They require no routine contact maintenance and provide 100% continuous current ratings.

Easy service/access - Single-plug harness connection and compatible terminal markings simplify servicing. Access space is ample. Door-mounted controls are field-programmable; no tool is required.

Complete product line - Cummins Power Generation offers a wide range of equipment, accessories and services to suit virtually any backup power application.

Warranty and service - Products are backed by a comprehensive warranty and a worldwide network of distributors with factory-trained service technicians.

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Transfer switch mechanism

- Transfer switch mechanism is electrically operated and mechanically held in the Source 1 and Source 2 positions. The transfer switch incorporates electrical and mechanical interlocks to prevent inadvertent interconnection of the sources.
- Independent break-before-make action is used for both 3-pole and 4-pole/switched neutral switches. This design allows use of sync check operation when required, or control of the operating speed of the transfer switch for proper transfer of motor and rectifier-based loads (programmed transition feature).
- True 4-pole switching allows for proper ground (earth) fault sensing and consistent, reliable operation for the life of the transfer switch. The neutral poles of the transfer switch have the same ratings as the phase poles and are operated by a common crossbar mechanism, eliminating the possibility of incorrect neutral operation at any point in the operating cycle, or due to failure of a neutral operator.
- Electrical interlocks prevent simultaneous closing signals to normal and emergency contacts and interconnection of normal and emergency sources through the control wiring.
- High pressure silver alloy contacts resist burning and pitting. Separate arcing surfaces further protect the main contacts. Contact wear is reduced by multiple leaf arc chutes that cool and quench the arcs. Barriers separate the phases to prevent interphase flashover. A transparent protective cover allows visual inspection while inhibiting inadvertent contact with energized components.
- Switch mechanism, including contact assemblies, is third-party certified to verify suitability for applications requiring high endurance switching capability for the life of the transfer switch. Withstand and closing ratings are validated using the same set of contacts, further demonstrating the robust nature of the design.

Specifications

Voltage rating	Transfer switches rated from 40 A through 1200 A are rated up to 600 VAC, 50 or 60 Hz.
Arc interruption	Multiple leaf arc chutes cool and quench the arcs. Barriers prevent interphase flashover.
Neutral bar	A full current-rated neutral bar with lugs is standard on enclosed 3-pole transfer switches.
Auxiliary contacts	Two contacts (one for each source) are provided for customer use. Wired to terminal block for easy access. Rated at 10A continuous and 250 VAC maximum.
Operating temperature	-22 °F (-30 °C) to 140 °F (60 °C)
Storage temperature	-40 °F (-40 °C) to 140 °F (60 °C)
Humidity	Up to 95% relative, non-condensing
Altitude	Up to 10,000 ft (3,000 m) without derating
Total transfer time (source-to-source)	Will not exceed 6 cycles at 60 Hz with normal voltage applied to the actuator and without delayed transition enabled.
Manual operation handles	Transfer switches are equipped with permanently attached operating handles and quick-break, quick-make contact mechanisms suitable for manual operation under de-energized conditions.

Open transition/programmed – Controls the time required for the device to switch from source to source, so that the load-generated voltages decay to a safe level before connecting to an energized source. Recommended by NEMA MG-1 to prevent nuisance tripping breakers and load damage. Adjustable 0-60 seconds, default 0 seconds.

Open transition/in-phase – Initiates open transition transfer when in-phase monitor senses both sources are in phase. Operates in a break-before-make sequence. Includes ability to enable programmed transition as a backup. If sources are not in phase within 120 seconds, the system will transfer using programmed transition.

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Microprocessor control

- Simple, easy-to-use control provides transfer switch information and operator controls
- LED lamps for source availability and source connected indication, exercise mode, and test mode. LED status lamps also provided for control set-up and configuration.
- Pushbutton controls for initiating test, overriding time delays and setting exercise time.
- Field-configurable for in-phase open or programmed open transition.
- Integral exerciser clock
- Control is prototype-tested to withstand voltage surges per EN 60947-6-1.
- Gold-flashed generator start contacts

Control functions

Voltage sensing: All phases on the normal source and single phase on generator source. Normal Source Pickup: adjustable 90-95%, Dropout: adjustable 70-90% of nominal voltage; Generator Source Pickup: 90%, dropout: 75% of nominal voltage.

Frequency sensing: Generator Source Pickup: 90% of nominal frequency; Dropout: 75% of nominal frequency.

Exerciser clock: Switch is furnished with an integral engine exerciser configurable for operation on a 7, 14, 21, or 28-day cycle with a fixed exercise period duration of 20 minutes. A 12-hr exerciser time offset allows for the convenient setting of exercise time without the need to activate the timer at the exact time that you need to schedule the generator exercise for. Software selectable capability allows for the exercising of the generator with or without load.

Time-delay functions

Engine start: Prevents nuisance genset starts due to momentary power system variation or loss. Adjustable: 0-10 seconds; default: 3 seconds.

Transfer normal to emergency: Allows genset to stabilize before application of load. Prevents power interruption if normal source variation or loss is momentary. Allows staggered transfer of loads in multiple transfer switch systems. Adjustable 0-300 seconds, default 5 seconds.

Retransfer emergency to normal: Allows the utility to stabilize before retransfer of load. Prevents needless power interruption if return of normal source is momentary. Allows staggered transfer of loads in multiple transfer switch systems. Adjustable 0-30 minutes, default 10 minutes.

Genset stop: Maintains availability of the genset for immediate reconnection in the event that the normal source fails shortly after transfer. Allows gradual genset cool down by running unloaded. Adjustable 0-30 minutes, default 10 minutes.

Delayed (programmed) transition: Controls the speed of operation of the transfer switch power contacts to allow load generated voltages from inductive devices to decay prior to connecting a live source. Adjustable 0-10 seconds, default 0 seconds.

Elevator signal: Provides a relay output contact for the elevator signal relay (load disconnect). The signal can also be configured to provide a post transfer delay of the same duration. Adjustable: 0-300 seconds (requires optional elevator signal relay for use).

Options

Elevator signal relay: Provides a relay output contact for the signal relay function.

Programmable exerciser clock: Provides a fully-programmable 7-day clock to provide greater flexibility in scheduling exercise periods than standard integral exerciser. Time-of-day setting feature operates generator during periods of high utility rates.

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UL withstand and closing ratings

The transfer switches listed below must be protected by circuit breakers or fuses. Referenced drawings include detailed listings of specific breakers or fuse types that must be used with the respective transfer switches. Consult with your distributor/dealer to obtain the necessary drawings. Withstand and Closing Ratings (WCR) are stated in symmetrical RMS amperes.

	MCCB protection			Special circuit breaker protection		
Transfer switch ampere	**WCR at volts max with specific manufacturers MCCBs**	**Max MCCB rating**	**Drawing reference**	**With specific current limiting breakers (CLB)**	**Max CLB rating**	**Drawing reference**
40, 70, 125 3-pole	14,000 at 600	225 A	098-6885	200,000 @ 600	225 A	098-6918
40, 70, 125 4-pole	30,000 at 600	225 A	098-6885	200,000 @ 600	225 A	098-6918
150, 225, 260	30,000 at 600	400 A	098-6886	200,000 @ 600	400 A	098-6919
300, 400, 600	65,000 at 600	1200 A	098-6887	200,000 @ 600	1200 A	098-6920
800, 1000	65,000 at 480 50,000 at 600	1400 A	098-6888	200,000 @ 600	1400 A	098-6921
1200	85,000 at 480 65,000 at 600	1600 A	A030U183	200,000 @ 600	1600 A	A030U185

Fuse protection

Transfer switch ampere	**WCR at volts max. with current limiting fuses**	**Max fuse, size and type**	**Drawing reference**
40, 70, 125 3- and 4-pole	200,000 at 600	200 A Class, J, RK1, RK5, T	098-6885
150, 225, 260	200,000 at 600	1200 A Class L or T, or 600 A class J, RK1, RK5	098-6886
300, 400, 600	200,000 at 600	1200 A Class L or T, or 600 A Class, J, RK1, RK5	098-6887
800, 1000	200,000 at 600	2000 A Class L or 1200 A class T or 600 A class J, RK1, RK5	098-6888
1200	200,000 at 600	2000 A Class L or 1200 A class T or 600 A class J, RK1, RK5	A030U183

3-cycle ratings

Transfer switch ampere	**WCR at volts max 3-cycle rating**	**Max MCCB rating**	**Drawing reference**
1200	42,000 at 600	2000 amps	A030U183

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Enclosures

The transfer switch and control are wall-mounted in a key-locking enclosure. Wire bend space complies with 2008 NEC.

Dimensions - transfer switch in UL type 1 enclosure

	Height		Width		Depth				Weight		Outline drawing
					Door closed		Door open				
Amp rating	in	mm	in	mm	in	mm	in	mm	lb	kg	
40, 70, 125 3-pole	27.0	686	20.5	521	12.0	305	31.5	800	82	37	0310-0544
40, 70, 125 4-pole	35.5	902	26.0	660	16.0	406	41.0	1042	165	75	0500-4896
150, 225	35.5	902	26.0	660	16.0	406	41.0	1042	165	75	0310-0414
260	43.5	1105	28.5	724	16.0	406	43.0	1093	170	77	0310-0540
300, 400, 600	54.0	1372	25.5	648	18.0	457	42.0	1067	225	102	0310-1307
800, 1000	68.0	1727	30.0	762	19.5	495	48.5	1232	360	163	0310-0417
1200	90.0	2286	39.0	991	27.0	698	63.0	1600	730	331	A030L411

Dimensions - transfer switch in UL type 3R, 4, 4X, or 12 enclosure

	Height		Width		Depth				Weight		Cabinet type	Outline drawing
					Door closed		Door open					
Amp rating	in	mm	in	mm	in	mm	in	mm	lb	kg		
40, 70, 125 3-pole	34.0	864	26.5	673	12.5	318	36.5	927	125	57	3R, 12	0310-0453
											4	0310-0445
	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	4X	0500-4184
40, 70, 125 4-pole	42.5	1080	30.5	775	16.0	406	44.0	1118	215	97	3R, 12	0500-4896
											4	0500-4896
	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	4X	0500-4184
150, 225	42.5	1080	30.5	775	16.0	406	44.0	1118	215	97	3R, 12	0310-0454
											4	0310-0446
	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	4X	0500-4184
260	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	3R, 12	0310-0455
											4	0310-0447
											4X	0500-4184
300, 400, 600	59.0	1499	27.5	699	16.5	419	41.5	1054	275	125	3R, 12	0310-1315
											4	0310-1316
	73.5	1867	32.5	826	19.5	495	49.5	1257	410	186	4X	0500-4185
800, 1000	73.5	1867	32.5	826	19.5	495	49.5	1257	410	186	3R, 12	0310-0457
											4	0310-0449
											4X	0500-4185
1200	90.0	2286	39.0	991	27.0	698	63.0	1600	730	331	3R, 12, 4, 4X	A030L411

Transfer switch lug capacities

All lugs accept copper or aluminum wire unless indicated otherwise.

Transfer switch ampere	Cables per phase	Size
40, 70, 125 3-pole	1	#12 AWG-2/0
40 4-pole	1	#12 AWG-2/0
70, 125 4-pole	1	#6 AWG - 300 MCM
150, 225	1	#6 AWG - 300 MCM
260	1	#6 AWG - 400 MCM
300, 400	1	3/0 - 600 MCM
300, 400	2	3/0 - 250 MCM
600	2	250 - 500 MCM
800	4	250 - 500 MCM
1000,1200	4	#2 AWG-750 MCM

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Submittal detail

Amperage ratings
- ☐ 40
- ☐ 70
- ☐ 125
- ☐ 150
- ☐ 225
- ☐ 260
- ☐ 300
- ☐ 400
- ☑ 600
- ☐ 800
- ☐ 1000
- ☐ 1200

Voltage ratings
- ☐ R020 120
- ☐ R038 190
- ☐ R021 208
- ☐ R022 220
- ☐ R023 240
- ☐ R024 380
- ☐ R025 416
- ☐ R035 440
- ☑ R026 480
- ☐ R027 600

Pole configuration
- ☑ A028 Poles - 3 (solid neutral)
- ☐ A029 Poles - 4 (switched neutral)

Frequency
- ☑ A044 60 Hertz
- ☐ A045 50 Hertz

Application
- ☑ A035 Utility to genset

System options
- ☐ A041 Single phase, 2-wire or 3-wire
- ☑ A042 Three phase, 3-wire or 4-wire

Enclosure
- ☐ B002 Type 3R: intended for outdoor use, provides some protection from dirt, rain and snow (similar to IEC Type IP34)
- ☐ B003 Type 4: indoor or outdoor use, provides some protection from wind-blown dust and water spary (similar to IEC Type IP65)
- ☐ B010 Type 12: indoor use, some protection from dust (similar to IEC Type IP61)
- ☐ B025 Type 4X: stainless steel, indoor or outdoor use, provides some protection from corrosion (similar to IEC Type IP65)

Standards
- ☑ A046 UL 1008/CSA certification
- ☐ A080 Seismic certification

Control voltage
- ☐ M033 12V, Genset starting voltage
- ☑ M034 24V, Genset starting voltage

Control options
- ☐ J030 External exercise clock
- ☑ M032 Elevator signal relay

Battery chargers
- ☐ K001 2 amps, 12/24 volts
- ☐ KB59 15 amps, 12 volts
- ☐ KB60 12 amps, 24 volts

Auxiliary relays

Relays are UL Listed and factory installed. All relays provide (2) normally closed isolated contacts rated 10 A @ 600 VAC. Relay terminals accept (1) 18 gauge to (2) 12 gauge wires per terminal.

- ☐ L101 24 VDC coil - installed, not wired (for customer use).
- ☐ L102 24 VDC coil - emergency position - relay energized when switch is in source 2 (emergency) position.
- ☐ L103 24 VDC coil - normal position - relay energized when switch is in source 1 (normal) position
- ☐ L201 12 VDC coil installed, not wired (for customer use)
- ☐ L202 12 VDC coil - emergency position - relay energized when switch is in source 2 (emergency) position
- ☐ L203 12 VDC coil - normal position - relay energized when switch is in source 1 (normal) position

Miscellaneous options
- ☑ C027 Cover - guard
- ☐ M003 Terminal block - 30 points (not wired)

Optional lug kits
- ☐ N032 Lug adapters, compression, ½ stab
- ☐ N045 Cable lugs, mechanical, 600 MCM, 4 per pole
- ☐ N066 Cable lugs, mechanical, 750 MCM, 4 per pole

Warranty
- ☐ G009 1 year comprehensive
- ☐ G004 2 year comprehensive
- ☐ G006 5 year basic
- ☑ G007 5 year comprehensive
- ☐ G008 10 year major components

Shipping
- ☐ A051 Packing - export box (800-1000 A)

Accessories
- ☐ AC-170 Accessories specifications sheet

Cummins Power Generation

Americas
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574 5000
Fax: 763 574 5298

Europe, CIS, Middle East and Africa
Manston Park Columbus Ave.
Manston Ramsgate
Kent CT 12 5BF United Kingdom
Phone 44 1843 255000
Fax 44 1843 255902

Asia Pacific
10 Toh Guan Road #07-01
TT International Tradepark
Singapore 608838
Phone 65 6417 2388
Fax 65 6417 2399

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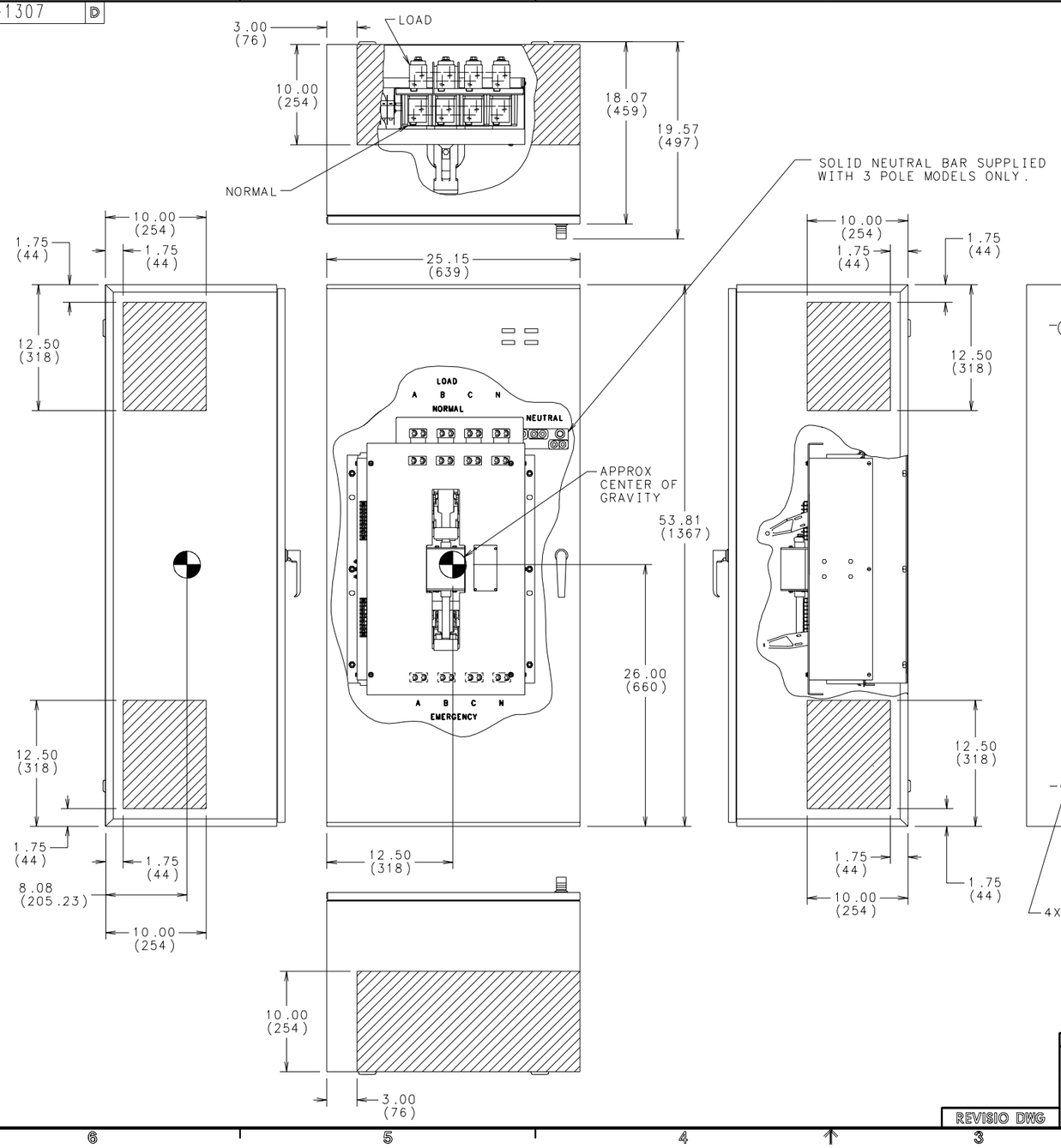
ER NO.	LTR	NO.	REVISION	ZONE	DR	CHKR	APPROVED	DATE
FR01608	A	1	PRODUCTION RELEASE	-	LK	LHS	L.SWITH	05-19-99
FR05274	B	1	WAS 4-250 (120) MCM CU-AL QTY 1	2-C	DD	LHS	L.SWITH	04-13-00
FR01737I	C	1	DIM 18.07 (459) WAS 18.07 (459)	4-D	RWM	BG	L.SWITH	08-05-03
		2	DIM 19.57 (497) WAS 19.57 (459)	4-D	RWM	BG	L.SWITH	08-05-03



NOTES:

1. UL TYPE 1 ENCLOSURE
2. APPROX. WEIGHT: 225 LBS
   MASS: 102 kg
3. DIMENSIONS IN ( ) ARE MILLIMETRES.
4. LUG CAPACITY: 300, 400 AMP
   (QUANTITY 1 WIRE) 3/0-600 (95-300) MCM CU-AL
   (QUANTITY 2 WIRES) 3/0-250 (25-120) MCM CU-AL
   LUG CAPACITY: 600 AMP
   (QUANTITY 2 WIRES) 250-500 (120-240) MCM CU-AL.
5. USE SEPARATE CONDUITS FOR CONTROL WIRING AND POWER WIRING. DO NOT COMBINE.
6. SHADED AREA INDICATES WIRING AND CABLE ENTRANCE AREA DO NOT INSTALL OUTSIDE OF SHADED AREA.
7. WIRE BENDING SPACE CONFORMS TO NEC TABLE 373-6 (B).
8. REFER TO NATIONAL ELECTRIC CODE, ARTICLE 110-16 WHICH STATES THE REQUIREMENT FOR THE MINIMUM CLEAR SPACE IN FRONT OF THIS UNIT.
9. 4 POLE SWITCHED NEUTRAL TRANSFER SWITCH SHOWN. A SOLID NEUTRAL BAR IS PROVIDED WITH 3 POLE TRANSFER SWITCHES.

3 AND 4 POLE

REVISIO DWG

DO NOT SCALE PRINT

TOLERANCE UNLESS OTHERWISE SPECIFIED

mm	inch
X ± .X	.X ± .X
.XX ±	.XX ±
.XXX ±	.XXX ±
0.00-1.99 ±0.13/-0.08	.XX-.240 ±.005/-.003
2.00-3.99 ±0.25/-0.18	.241-.437 ±.008/-.004
4.00-17.99 ±0.25/-0.13	.438-.783 ±.010/-.005
17.30-24.99 ±0.38/-0.13	.224-.999 ±.013/-.005
ANG TOL ±	DRAWN TO SCALE OF 3/16

QTY

SIM TO CERTIFIED FROM 0310-0416 D

THIRD ANGLE PROJECTION

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ITEM	PART NO.	DWG SIZE	DESCRIPTION OR MATERIAL	REF DES

	NAME	DATE
DR	L. KAPLAN	05-18-99
CHKR	L. SMITH	05-18-99
MFG		
APPROVED	L. SMITH	05-18-99

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ANSI Y14.5M-1982

MODEL FIRST USED ON OTPC 300-600A

Cummins Onan

MINNEAPOLIS, MINNESOTA 55432

TITLE OUTLINE-CONTROL BOX

DWG NO. 0310-1307

SHEET 1 of 1

DWG SIZE D

Transfer switch OTEC open transition

225 Amp, 4 Pole, 480VAC

> Specification sheet

40 - 1200 Amp

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Description

OTEC transfer switches are designed for operation and switching of electrical loads between primary power and standby generator sets. They are suitable for use in emergency, legally required, and optional standby applications. The switches monitor both power sources, signal generator set startup, automatically transfer power, and return the load to the primary power source once a stable utility is available.

The fully integrated controller is designed for practical functionality, with LED indicators and digital pushbuttons for ease of operator use.

UL	All switches are UL 1008 Listed with UL Type Rated cabinets and UL Listed CU-AL terminals.
CSA	All switches are certified to CSA 282 Emergency Electrical Power Supply for Buildings, up to 600 VAC.
NEC	Equipment shall be suitable for use in systems compliant to 700, 701 and 702.
NFPA	All switches comply with NFPA 70, 99 and 110.
NEMA	All switches comply with NEMA ICS 10.
IEEE	All switches comply with IEEE 446 Recommended Practice for Emergency and Standby Power Systems.
ISO 9001	This transfer switch is designed and manufactured in facilities certified to ISO9001.

Features

Microprocessor control - Easy-to-use, standard control. LEDs display transfer switch status; pushbuttons allow operator to activate control test, exercise timing and transfer mode.

Programmed transition – Open transition timing can be adjusted to completely disconnect the load from both sources for a programmed time period, as recommended by NEMA MG-1 for transfer of inductive loads.

Advanced transfer switch mechanism - Unique bi-directional linear actuator provides virtually friction-free, constant force, straight-line transfer switch action during automatic operation.

Manual operation - Manual operating handles, shielded termination, and over-center contact mechanisms allow effective manual operation under de-energized conditions.

Positive interlocking - Mechanical and electrical interlocking prevent source-to-source connection through the power or control wiring.

Main contacts - Heavy-duty silver alloy contacts with multi-leaf arc chutes are rated for 100% load interruption. They require no routine contact maintenance and provide 100% continuous current ratings.

Easy service/access - Single-plug harness connection and compatible terminal markings simplify servicing. Access space is ample. Door-mounted controls are field-programmable; no tool is required.

Complete product line - Cummins Power Generation offers a wide range of equipment, accessories and services to suit virtually any backup power application.

Warranty and service - Products are backed by a comprehensive warranty and a worldwide network of distributors with factory-trained service technicians.

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S-1464n (7/10)

Transfer switch mechanism

- Transfer switch mechanism is electrically operated and mechanically held in the Source 1 and Source 2 positions. The transfer switch incorporates electrical and mechanical interlocks to prevent inadvertent interconnection of the sources.
- Independent break-before-make action is used for both 3-pole and 4-pole/switched neutral switches. This design allows use of sync check operation when required, or control of the operating speed of the transfer switch for proper transfer of motor and rectifier-based loads (programmed transition feature).
- True 4-pole switching allows for proper ground (earth) fault sensing and consistent, reliable operation for the life of the transfer switch. The neutral poles of the transfer switch have the same ratings as the phase poles and are operated by a common crossbar mechanism, eliminating the possibility of incorrect neutral operation at any point in the operating cycle, or due to failure of a neutral operator.
- Electrical interlocks prevent simultaneous closing signals to normal and emergency contacts and interconnection of normal and emergency sources through the control wiring.
- High pressure silver alloy contacts resist burning and pitting. Separate arcing surfaces further protect the main contacts. Contact wear is reduced by multiple leaf arc chutes that cool and quench the arcs. Barriers separate the phases to prevent interphase flashover. A transparent protective cover allows visual inspection while inhibiting inadvertent contact with energized components.
- Switch mechanism, including contact assemblies, is third-party certified to verify suitability for applications requiring high endurance switching capability for the life of the transfer switch. Withstand and closing ratings are validated using the same set of contacts, further demonstrating the robust nature of the design.

Specifications

Voltage rating	Transfer switches rated from 40 A through 1200 A are rated up to 600 VAC, 50 or 60 Hz.
Arc interruption	Multiple leaf arc chutes cool and quench the arcs. Barriers prevent interphase flashover.
Neutral bar	A full current-rated neutral bar with lugs is standard on enclosed 3-pole transfer switches.
Auxiliary contacts	Two contacts (one for each source) are provided for customer use. Wired to terminal block for easy access. Rated at 10A continuous and 250 VAC maximum.
Operating temperature	-22 °F (-30 °C) to 140 °F (60 °C)
Storage temperature	-40 °F (-40 °C) to 140 °F (60 °C)
Humidity	Up to 95% relative, non-condensing
Altitude	Up to 10,000 ft (3,000 m) without derating
Total transfer time (source-to-source)	Will not exceed 6 cycles at 60 Hz with normal voltage applied to the actuator and without delayed transition enabled.
Manual operation handles	Transfer switches are equipped with permanently attached operating handles and quick-break, quick-make contact mechanisms suitable for manual operation under de-energized conditions.

Open transition/programmed – Controls the time required for the device to switch from source to source, so that the load-generated voltages decay to a safe level before connecting to an energized source. Recommended by NEMA MG-1 to prevent nuisance tripping breakers and load damage. Adjustable 0-60 seconds, default 0 seconds.

Open transition/in-phase – Initiates open transition transfer when in-phase monitor senses both sources are in phase. Operates in a break-before-make sequence. Includes ability to enable programmed transition as a backup. If sources are not in phase within 120 seconds, the system will transfer using programmed transition.

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Cummins Power Generation

Microprocessor control

- Simple, easy-to-use control provides transfer switch information and operator controls
- LED lamps for source availability and source connected indication, exercise mode, and test mode. LED status lamps also provided for control set-up and configuration.
- Pushbutton controls for initiating test, overriding time delays and setting exercise time.
- Field-configurable for in-phase open or programmed open transition.
- Integral exerciser clock
- Control is prototype-tested to withstand voltage surges per EN 60947-6-1.
- Gold-flashed generator start contacts

Control functions

Voltage sensing: All phases on the normal source and single phase on generator source. Normal Source Pickup: adjustable 90-95%, Dropout: adjustable 70-90% of nominal voltage; Generator Source Pickup: 90%, dropout: 75% of nominal voltage.

Frequency sensing: Generator Source Pickup: 90% of nominal frequency; Dropout: 75% of nominal frequency.

Exerciser clock: Switch is furnished with an integral engine exerciser configurable for operation on a 7, 14, 21, or 28-day cycle with a fixed exercise period duration of 20 minutes. A 12-hr exerciser time offset allows for the convenient setting of exercise time without the need to activate the timer at the exact time that you need to schedule the generator exercise for. Software selectable capability allows for the exercising of the generator with or without load.

Time-delay functions

Engine start: Prevents nuisance genset starts due to momentary power system variation or loss. Adjustable: 0-10 seconds; default: 3 seconds.

Transfer normal to emergency: Allows genset to stabilize before application of load. Prevents power interruption if normal source variation or loss is momentary. Allows staggered transfer of loads in multiple transfer switch systems. Adjustable 0-300 seconds, default 5 seconds.

Retransfer emergency to normal: Allows the utility to stabilize before retransfer of load. Prevents needless power interruption if return of normal source is momentary. Allows staggered transfer of loads in multiple transfer switch systems. Adjustable 0-30 minutes, default 10 minutes.

Genset stop: Maintains availability of the genset for immediate reconnection in the event that the normal source fails shortly after transfer. Allows gradual genset cool down by running unloaded. Adjustable 0-30 minutes, default 10 minutes.

Delayed (programmed) transition: Controls the speed of operation of the transfer switch power contacts to allow load generated voltages from inductive devices to decay prior to connecting a live source. Adjustable 0-10 seconds, default 0 seconds.

Elevator signal: Provides a relay output contact for the elevator signal relay (load disconnect). The signal can also be configured to provide a post transfer delay of the same duration. Adjustable: 0-300 seconds (requires optional elevator signal relay for use).

Options

Elevator signal relay: Provides a relay output contact for the signal relay function

Programmable exerciser clock: Provides a fully programmable 7 day clock to provide greater flexibility in scheduling exercise periods than standard integral exerciser. Time-of-day setting feature operates generator during periods of high utility rates.

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UL withstand and closing ratings

The transfer switches listed below must be protected by circuit breakers or fuses. Referenced drawings include detailed listings of specific breakers or fuse types that must be used with the respective transfer switches. Consult with your distributor/dealer to obtain the necessary drawings. Withstand and Closing Ratings (WCR) are stated in symmetrical RMS amperes.

	MCCB protection			Special circuit breaker protection		
Transfer switch ampere	**WCR at volts max with specific manufacturers MCCBs**	**Max MCCB rating**	**Drawing reference**	**With specific current limiting breakers (CLB)**	**Max CLB rating**	**Drawing reference**
40, 70, 125 3-pole	14,000 at 600	225 A	098-6885	200,000 @ 600	225 A	098-6918
40, 70, 125 4-pole	30,000 at 600	225 A	098-6885	200,000 @ 600	225 A	098-6918
150, 225, 260	30,000 at 600	400 A	098-6886	200,000 @ 600	400 A	098-6919
300, 400, 600	65,000 at 600	1200 A	098-6887	200,000 @ 600	1200 A	098-6920
800, 1000	65,000 at 480 50,000 at 600	1400 A	098-6888	200,000 @ 600	1400 A	098-6921
1200	85,000 at 480 65,000 at 600	1600 A	A030U183	200,000 @ 600	1600 A	A030U185

Fuse protection

Transfer switch ampere	**WCR at volts max. with current limiting fuses**	**Max fuse, size and type**	**Drawing reference**
40, 70, 125 3- and 4-pole	200,000 at 600	200 A Class, J, RK1, RK5, T	098-6885
150, 225, 260	200,000 at 600	1200 A Class L or T, or 600 A class J, RK1, RK5	098-6886
300, 400, 600	200,000 at 600	1200 A Class L or T, or 600 A Class, J, RK1, RK5	098-6887
800, 1000	200,000 at 600	2000 A Class L or 1200 A class T or 600 A class J, RK1, RK5	098-6888
1200	200,000 at 600	2000 A Class L or 1200 A class T or 600 A class J, RK1, RK5	A030U183

3-cycle ratings

Transfer switch ampere	**WCR at volts max 3-cycle rating**	**Max MCCB rating**	**Drawing reference**
1200	42,000 at 600	2000 amps	A030U183

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Enclosures

The transfer switch and control are wall-mounted in a key-locking enclosure. Wire bend space complies with 2008 NEC.

Dimensions - transfer switch in UL type 1 enclosure

	Height		Width		Depth				Weight		Outline drawing
					Door closed		Door open				
Amp rating	in	mm	in	mm	in	mm	in	mm	lb	kg	
40, 70, 125 3-pole	27.0	686	20.5	521	12.0	305	31.5	800	82	37	0310-0544
40, 70, 125 4-pole	35.5	902	26.0	660	16.0	406	41.0	1042	165	75	0500-4896
150, 225	35.5	902	26.0	660	16.0	406	41.0	1042	165	75	0310-0414
260	43.5	1105	28.5	724	16.0	406	43.0	1093	176	77	0310-0540
300, 400, 600	54.0	1372	25.5	648	18.0	457	42.0	1067	225	102	0310-1307
800, 1000	68.0	1727	30.0	762	19.5	495	48.5	1232	360	163	0310-0417
1200	90.0	2286	39.0	991	27.0	698	63.0	1600	730	331	A030L411

Dimensions - transfer switch in UL type 3R, 4, 4X, or 12 enclosure

	Height		Width		Depth				Weight		Cabinet type	Outline drawing
					Door closed		Door open					
Amp rating	in	mm	in	mm	in	mm	in	mm	lb	kg		
40, 70, 125 3-pole	34.0	864	26.5	673	12.5	318	36.5	927	125	57	3R, 12	0310-0453
											4	0310-0445
	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	4X	0500-4184
40, 70, 125 4-pole	42.5	1080	30.5	775	16.0	406	44.0	1118	215	97	3R, 12	0500-4896
											4	0500-4896
	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	4X	0500-4184
150, 225	42.5	1080	30.5	775	16.0	406	44.0	1118	215	97	3R, 12	0310-0454
											4	0310-0446
	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	4X	0500-4184
260	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	3R, 12	0310-0455
											4	0310-0447
											4X	0500-4184
300, 400, 600	59.0	1499	27.5	699	16.5	419	41.5	1054	275	125	3R, 12	0310-1315
											4	0310-1316
	73.5	1867	32.5	826	19.5	495	49.5	1257	410	186	4X	0500-4185
800, 1000	73.5	1867	32.5	826	19.5	495	49.5	1257	410	186	3R, 12	0310-0457
											4	0310-0449
											4X	0500-4185
1200	90.0	2286	39.0	991	27.0	698	63.0	1600	730	331	3R, 12, 4, 4X	A030L411

Transfer switch lug capacities

All lugs accept copper or aluminum wire unless indicated otherwise.

Transfer switch ampere	Cables per phase	Size
40, 70, 125 3-pole	1	#12 AWG-2/0
40 4-pole	1	#12 AWG-2/0
70, 125 4-pole	1	#6 AWG - 300 MCM
150, 225	1	#6 AWG - 300 MCM
260	1	#6 AWG - 400 MCM
300, 400	1	3/0 - 600 MCM
300, 400	2	3/0 - 250 MCM
600	2	250 - 500 MCM
800	4	250 - 500 MCM
1000,1200	4	#2 AWG-750 MCM

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S-1464n (7/10)

Power Generation

Submittal detail

Amperage ratings
- ☐ 40
- ☐ 70
- ☐ 125
- ☐ 150
- ☑ 225
- ☐ 260
- ☐ 300
- ☐ 400
- ☐ 600
- ☐ 800
- ☐ 1000
- ☐ 1200

Voltage ratings
- ☐ R020 120
- ☐ R038 190
- ☐ R021 208
- ☐ R022 220
- ☐ R023 240
- ☐ R024 380
- ☐ R025 416
- ☐ R035 440
- ☑ R026 480
- ☐ R027 600

Pole configuration
- ☐ A028 Poles - 3 (solid neutral)
- ☑ A029 Poles - 4 (switched neutral)

Frequency
- ☑ A044 60 Hertz
- ☐ A045 50 Hertz

Application
- ☑ A035 Utility to genset

System options
- ☐ A041 Single phase, 2-wire or 3-wire
- ☑ A042 Three phase, 3-wire or 4-wire

Enclosure
- ☐ B002 Type 3R: intended for outdoor use, provides some protection from dirt, rain and snow (similar to IEC Type IP34)
- ☐ B003 Type 4: indoor or outdoor use, provides some protection from wind-blown dust and water spary (similar to IEC Type IP65)
- ☐ B010 Type 12: indoor use, some protection from dust (similar to IEC Type IP61)
- ☐ B025 Type 4X: stainless steel, indoor or outdoor use, provides some protection from corrosion (similar to IEC Type IP65)

Standards
- ☑ A046 UL 1008/CSA certification
- ☐ A080 Seismic certification

Control voltage
- ☐ M033 12V, Genset starting voltage
- ☑ M034 24V, Genset starting voltage

Control options
- ☐ J030 External exercise clock
- ☑ M032 Elevator signal relay

Battery chargers
- ☐ K001 2 amps, 12/24 volts
- ☐ KB59 15 amps, 12 volts
- ☐ KB60 12 amps, 24 volts

Auxiliary relays

Relays are UL Listed and factory installed. All relays provide (2) normally closed isolated contacts rated 10 A @ 600 VAC. Relay terminals accept (1) 18 gauge to (2) 12 gauge wires per terminal.

- ☐ L101 24 VDC coil - installed, not wired (for customer use).
- ☐ L102 24 VDC coil - emergency position - relay energized when switch is in source 2 (emergency) position.
- ☐ L103 24 VDC coil - normal position - relay energized when switch is in source 1 (normal) position
- ☐ L201 12 VDC coil installed, not wired (for customer use)
- ☐ L202 12 VDC coil - emergency position - relay energized when switch is in source 2 (emergency) position
- ☐ L203 12 VDC coil - normal position - relay energized when switch is in source 1 (normal) position

Miscellaneous options
- ☑ C027 Cover - guard
- ☐ M003 Terminal block - 30 points (not wired)

Optional lug kits
- ☐ N032 Lug adapters, compression, ½ stab
- ☐ N045 Cable lugs, mechanical, 600 MCM, 4 per pole
- ☐ N066 Cable lugs, mechanical, 750 MCM, 4 per pole

Warranty
- ☐ G009 1 year comprehensive
- ☐ G004 2 year comprehensive
- ☐ G006 5 year basic
- ☑ G007 5 year comprehensive
- ☐ G008 10 year major components

Shipping
- ☐ A051 Packing - export box (800-1000 A)

Accessories
- ☐ AC-170 Accessories specifications sheet

Cummins Power Generation

Americas
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574 5000
Fax: 763 574 5298

Europe, CIS, Middle East and Africa
Manston Park Columbus Ave.
Manston Ramsgate
Kent CT 12 5BF United Kingdom
Phone 44 1843 255000
Fax 44 1843 255902

Asia Pacific
10 Toh Guan Road #07-01
TT International Tradepark
Singapore 608838
Phone 65 6417 2388
Fax 65 6417 2399

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Power Generation

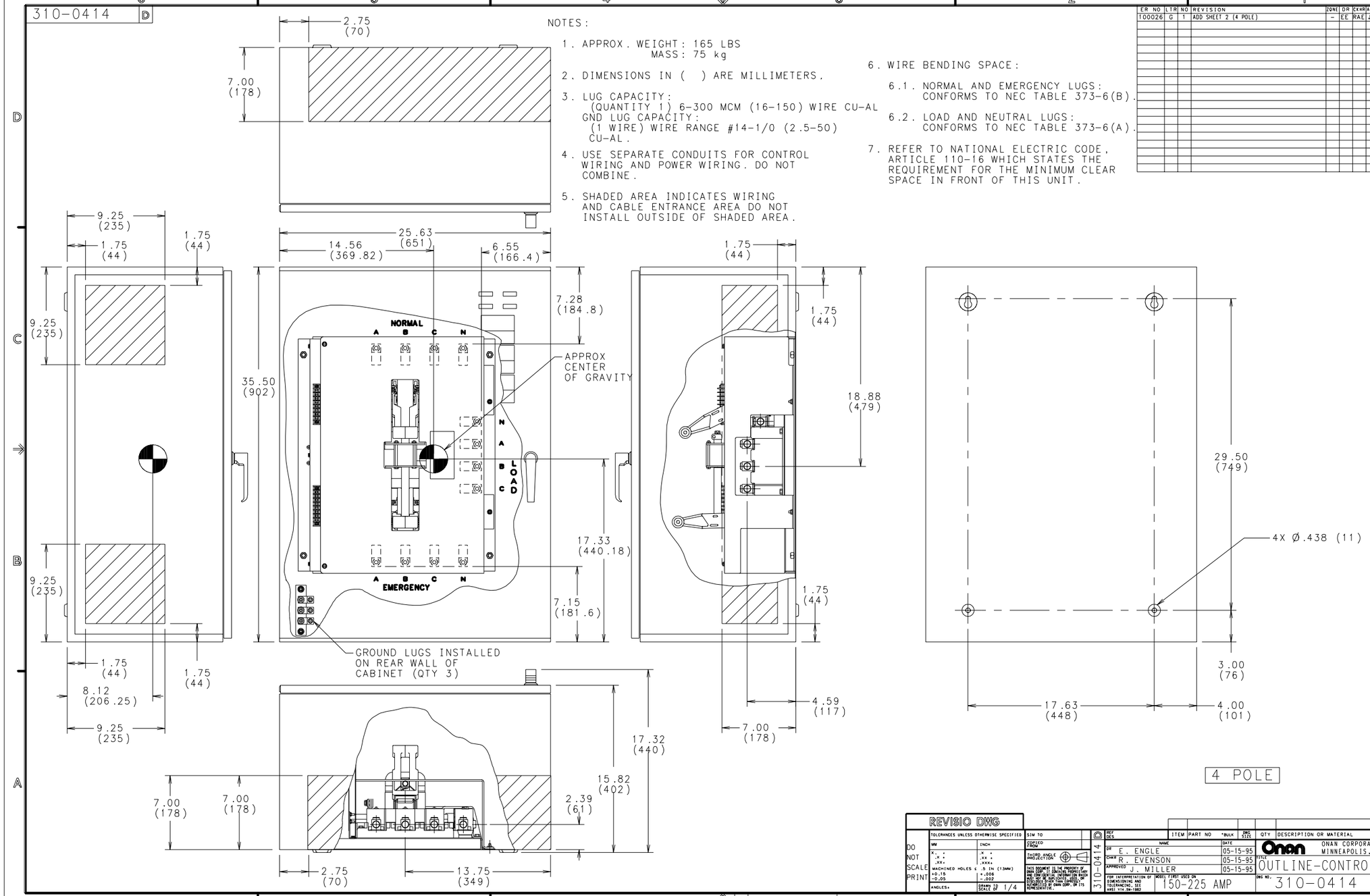
Exported on: Oct 18 2006 and is an Un-Controlled Document

310-0414 D

NOTES:

1. APPROX. WEIGHT: 165 LBS
   MASS: 75 kg
2. DIMENSIONS IN ( ) ARE MILLIMETERS.
3. LUG CAPACITY:
   (QUANTITY 1) 6-300 MCM (16-150) WIRE CU-AL
   GND LUG CAPACITY:
   (1 WIRE) WIRE RANGE #14-1/0 (2.5-50)
   CU-AL.
4. USE SEPARATE CONDUITS FOR CONTROL WIRING AND POWER WIRING. DO NOT COMBINE.
5. SHADED AREA INDICATES WIRING AND CABLE ENTRANCE AREA DO NOT INSTALL OUTSIDE OF SHADED AREA.
6. WIRE BENDING SPACE:
   6.1. NORMAL AND EMERGENCY LUGS: CONFORMS TO NEC TABLE 373-6(B).
   6.2. LOAD AND NEUTRAL LUGS: CONFORMS TO NEC TABLE 373-6(A).
7. REFER TO NATIONAL ELECTRIC CODE, ARTICLE 110-16 WHICH STATES THE REQUIREMENT FOR THE MINIMUM CLEAR SPACE IN FRONT OF THIS UNIT.

ER NO	LTR	NO	REVISION	ZONE	DR	CK#R	APPROVED	DATE
100026	G	1	ADD SHEET 2 (4 POLE)	-	EE	RAE	J.MILLER	05-15-95



4 POLE

REVISIO DNG

TOLERANCES UNLESS OTHERWISE SPECIFIED		SIM TO
MM	INCH	FORCED FROM
X . *	.X *	THIRD ANGLE PROJECTION
.X *	.XX *	
.XX*	.XXX*	
MACHINED HOLES ± .5 IN (13MM)		
+0.15 -0.05	+.006 -.002	
ANGLES*	DRAWN AT SCALE OF 1/4	

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REF DES	ITEM	PART NO	*BULK	DWG SIZE	QTY	DESCRIPTION OR MATERIAL

	NAME	DATE
DR	E. ENGLE	05-15-95
CHK'R	R. EVENSON	05-15-95
APPROVED	J. MILLER	05-15-95

ONAN CORPORATION
MINNEAPOLIS, MINNESOTA

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ANSI Y14.5M-1982

MODEL/FIRST USED ON: 150-225 AMP

TITLE: OUTLINE-CONTROL BOX

DWG NO: 310-0414

SHEET 2 OF 2

DWG SIZE D

310-0414

310-0414 D

Transfer switch OTEC open transition

400 Amp, 4 Pole, 480 VAC

> Specification sheet

40 - 1200 Amp

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Description

OTEC transfer switches are designed for operation and switching of electrical loads between primary power and standby generator sets. They are suitable for use in emergency, legally required, and optional standby applications. The switches monitor both power sources, signal generator set startup, automatically transfer power, and return the load to the primary power source once a stable utility is available.

The fully integrated controller is designed for practical functionality, with LED indicators and digital pushbuttons for ease of operator use.

UL	All switches are UL 1008 Listed with UL Type Rated cabinets and UL Listed CU-AL terminals.
CSA	All switches are certified to CSA 282 Emergency Electrical Power Supply for Buildings, up to 600 VAC.
NEC	Equipment shall be suitable for use in systems compliant to 700, 701 and 702.
NFPA	All switches comply with NFPA 70, 99 and 110.
NEMA	All switches comply with NEMA ICS 10.
IEEE	All switches comply with IEEE 446 Recommended Practice for Emergency and Standby Power Systems.
ISO 9001	This transfer switch is designed and manufactured in facilities certified to ISO9001.

Features

Microprocessor control - Easy-to-use, standard control. LEDs display transfer switch status; pushbuttons allow operator to activate control test, exercise timing and transfer mode.

Programmed transition – Open transition timing can be adjusted to completely disconnect the load from both sources for a programmed time period, as recommended by NEMA MG-1 for transfer of inductive loads.

Advanced transfer switch mechanism - Unique bi-directional linear actuator provides virtually friction-free, constant force, straight-line transfer switch action during automatic operation.

Manual operation - Manual operating handles, shielded termination, and over-center contact mechanisms allow effective manual operation under de-energized conditions.

Positive interlocking - Mechanical and electrical interlocking prevent source-to-source connection through the power or control wiring.

Main contacts - Heavy-duty silver alloy contacts with multi-leaf arc chutes are rated for 100% load interruption. They require no routine contact maintenance and provide 100% continuous current ratings.

Easy service/access - Single-plug harness connection and compatible terminal markings simplify servicing. Access space is ample. Door-mounted controls are field-programmable; no tool is required.

Complete product line - Cummins Power Generation offers a wide range of equipment, accessories and services to suit virtually any backup power application.

Warranty and service - Products are backed by a comprehensive warranty and a worldwide network of distributors with factory-trained service technicians.

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S-1464n (7/10)

Transfer switch mechanism

- Transfer switch mechanism is electrically operated and mechanically held in the Source 1 and Source 2 positions. The transfer switch incorporates electrical and mechanical interlocks to prevent inadvertent interconnection of the sources.
- Independent break-before-make action is used for both 3-pole and 4-pole/switched neutral switches. This design allows use of sync check operation when required, or control of the operating speed of the transfer switch for proper transfer of motor and rectifier-based loads (programmed transition feature).
- True 4-pole switching allows for proper ground (earth) fault sensing and consistent, reliable operation for the life of the transfer switch. The neutral poles of the transfer switch have the same ratings as the phase poles and are operated by a common crossbar mechanism, eliminating the possibility of incorrect neutral operation at any point in the operating cycle, or due to failure of a neutral operator.
- Electrical interlocks prevent simultaneous closing signals to normal and emergency contacts and interconnection of normal and emergency sources through the control wiring.
- High pressure silver alloy contacts resist burning and pitting. Separate arcing surfaces further protect the main contacts. Contact wear is reduced by multiple leaf arc chutes that cool and quench the arcs. Barriers separate the phases to prevent interphase flashover. A transparent protective cover allows visual inspection while inhibiting inadvertent contact with energized components.
- Switch mechanism, including contact assemblies, is third-party certified to verify suitability for applications requiring high endurance switching capability for the life of the transfer switch. Withstand and closing ratings are validated using the same set of contacts, further demonstrating the robust nature of the design.

Specifications

Voltage rating	Transfer switches rated from 40 A through 1200 A are rated up to 600 VAC, 50 or 60 Hz.
Arc interruption	Multiple leaf arc chutes cool and quench the arcs. Barriers prevent interphase flashover.
Neutral bar	A full current-rated neutral bar with lugs is standard on enclosed 3-pole transfer switches.
Auxiliary contacts	Two contacts (one for each source) are provided for customer use. Wired to terminal block for easy access. Rated at 10A continuous and 250 VAC maximum.
Operating temperature	-22 °F (-30 °C) to 140 °F (60 °C)
Storage temperature	-40 °F (-40 °C) to 140 °F (60 °C)
Humidity	Up to 95% relative, non-condensing
Altitude	Up to 10,000 ft (3,000 m) without derating
Total transfer time (source-to-source)	Will not exceed 6 cycles at 60 Hz with normal voltage applied to the actuator and without delayed transition enabled.
Manual operation handles	Transfer switches are equipped with permanently attached operating handles and quick-break, quick-make contact mechanisms suitable for manual operation under de-energized conditions.

Open transition/programmed – Controls the time required for the device to switch from source to source, so that the load-generated voltages decay to a safe level before connecting to an energized source. Recommended by NEMA MG-1 to prevent nuisance tripping breakers and load damage. Adjustable 0-60 seconds, default 0 seconds.

Open transition/in-phase – Initiates open transition transfer when in-phase monitor senses both sources are in phase. Operates in a break-before-make sequence. Includes ability to enable programmed transition as a backup. If sources are not in phase within 120 seconds, the system will transfer using programmed transition.

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Cummins Power Generation

Microprocessor control

- Simple, easy-to-use control provides transfer switch information and operator controls
- LED lamps for source availability and source connected indication, exercise mode, and test mode. LED status lamps also provided for control set-up and configuration.
- Pushbutton controls for initiating test, overriding time delays and setting exercise time.
- Field-configurable for in-phase open or programmed open transition.
- Integral exerciser clock
- Control is prototype-tested to withstand voltage surges per EN 60947-6-1.
- Gold-flashed generator start contacts

Control functions

Voltage sensing: All phases on the normal source and single phase on generator source. Normal Source Pickup: adjustable 90-95%, Dropout: adjustable 70-90% of nominal voltage; Generator Source Pickup: 90%, dropout: 75% of nominal voltage.

Frequency sensing: Generator Source Pickup: 90% of nominal frequency; Dropout: 75% of nominal frequency.

Exerciser clock: Switch is furnished with an integral engine exerciser configurable for operation on a 7, 14, 21, or 28-day cycle with a fixed exercise period duration of 20 minutes. A 12-hr exerciser time offset allows for the convenient setting of exercise time without the need to activate the timer at the exact time that you need to schedule the generator exercise for. Software selectable capability allows for the exercising of the generator with or without load.

Time-delay functions

Engine start: Prevents nuisance genset starts due to momentary power system variation or loss. Adjustable: 0-10 seconds; default: 3 seconds.

Transfer normal to emergency: Allows genset to stabilize before application of load. Prevents power interruption if normal source variation or loss is momentary. Allows staggered transfer of loads in multiple transfer switch systems. Adjustable 0-300 seconds, default 5 seconds.

Retransfer emergency to normal: Allows the utility to stabilize before retransfer of load. Prevents needless power interruption if return of normal source is momentary. Allows staggered transfer of loads in multiple transfer switch systems. Adjustable 0-30 minutes, default 10 minutes.

Genset stop: Maintains availability of the genset for immediate reconnection in the event that the normal source fails shortly after transfer. Allows gradual genset cool down by running unloaded. Adjustable 0-30 minutes, default 10 minutes.

Delayed (programmed) transition: Controls the speed of operation of the transfer switch power contacts to allow load generated voltages from inductive devices to decay prior to connecting a live source. Adjustable 0-10 seconds, default 0 seconds.

Elevator signal: Provides a relay output contact for the elevator signal relay (load disconnect). The signal can also be configured to provide a post transfer delay of the same duration. Adjustable: 0-300 seconds (requires optional elevator signal relay for use).

Options

Elevator signal relay: Provides a relay output contact for the signal relay function

Programmable exerciser clock: Provides a fully programmable 7-day clock to provide greater flexibility in scheduling exercise periods than standard integral exerciser. Time-of-day setting feature operates generator during periods of high utility rates.

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Power Generation

UL withstand and closing ratings

The transfer switches listed below must be protected by circuit breakers or fuses. Referenced drawings include detailed listings of specific breakers or fuse types that must be used with the respective transfer switches. Consult with your distributor/dealer to obtain the necessary drawings. Withstand and Closing Ratings (WCR) are stated in symmetrical RMS amperes.

	MCCB protection			Special circuit breaker protection		
Transfer switch ampere	**WCR at volts max with specific manufacturers MCCBs**	**Max MCCB rating**	**Drawing reference**	**With specific current limiting breakers (CLB)**	**Max CLB rating**	**Drawing reference**
40, 70, 125 3-pole	14,000 at 600	225 A	098-6885	200,000 @ 600	225 A	098-6918
40, 70, 125 4-pole	30,000 at 600	225 A	098-6885	200,000 @ 600	225 A	098-6918
150, 225, 260	30,000 at 600	400 A	098-6886	200,000 @ 600	400 A	098-6919
300, 400, 600	65,000 at 600	1200 A	098-6887	200,000 @ 600	1200 A	098-6920
800, 1000	65,000 at 480 50,000 at 600	1400 A	098-6888	200,000 @ 600	1400 A	098-6921
1200	85,000 at 480 65,000 at 600	1600 A	A030U183	200,000 @ 600	1600 A	A030U185

Fuse protection

Transfer switch ampere	**WCR at volts max. with current limiting fuses**	**Max fuse, size and type**	**Drawing reference**
40, 70, 125 3- and 4-pole	200,000 at 600	200 A Class, J, RK1, RK5, T	098-6885
150, 225, 260	200,000 at 600	1200 A Class L or T, or 600 A class J, RK1, RK5	098-6886
300, 400, 600	200,000 at 600	1200 A Class L or T, or 600 A Class, J, RK1, RK5	098-6887
800, 1000	200,000 at 600	2000 A Class L or 1200 A class T or 600 A class J, RK1, RK5	098-6888
1200	200,000 at 600	2000 A Class L or 1200 A class T or 600 A class J, RK1, RK5	A030U183

3-cycle ratings

Transfer switch ampere	**WCR at volts max 3-cycle rating**	**Max MCCB rating**	**Drawing reference**
1200	42,000 at 600	2000 amps	A030U183

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Enclosures

The transfer switch and control are wall-mounted in a key-locking enclosure. Wire bend space complies with 2008 NEC.

Dimensions - transfer switch in UL type 1 enclosure

	Height		Width		Depth				Weight		Outline drawing
					Door closed		Door open				
Amp rating	in	mm	in	mm	in	mm	in	mm	lb	kg	
40, 70, 125 3-pole	27.0	686	20.5	521	12.0	305	31.5	800	82	37	0310-0544
40, 70, 125 4-pole	35.5	902	26.0	660	16.0	406	41.0	1042	165	75	0500-4896
150, 225	35.5	902	26.0	660	16.0	406	41.0	1042	165	75	0310-0414
260	43.5	1106	28.5	724	16.0	406	43.0	1093	170	77	0310-0540
300, 400, 600	54.0	1372	25.5	648	18.0	457	42.0	1067	225	102	0310-1307
800, 1000	68.0	1727	30.0	762	19.5	495	48.5	1232	360	163	0310-0417
1200	90.0	2286	39.0	991	27.0	698	63.0	1600	730	331	A030L411

Dimensions - transfer switch in UL type 3R, 4, 4X, or 12 enclosure

	Height		Width		Depth				Weight		Cabinet type	Outline drawing
					Door closed		Door open					
Amp rating	in	mm	in	mm	in	mm	in	mm	lb	kg		
40, 70, 125 3-pole	34.0	864	26.5	673	12.5	318	36.5	927	125	57	3R, 12	0310-0453
											4	0310-0445
	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	4X	0500-4184
40, 70, 125 4-pole	42.5	1080	30.5	775	16.0	406	44.0	1118	215	97	3R, 12	0500-4896
											4	0500-4896
	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	4X	0500-4184
150, 225	42.5	1080	30.5	775	16.0	406	44.0	1118	215	97	3R, 12	0310-0454
											4	0310-0446
	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	4X	0500-4184
260	46.0	1168	32.0	813	16.0	406	46.0	1168	255	102	3R, 12	0310-0455
											4	0310-0447
											4X	0500-4184
300, 400, 600	59.0	1499	27.5	699	16.5	419	41.5	1054	275	125	3R, 12	0310-1315
											4	0310-1316
	73.5	1867	32.5	826	19.5	495	49.5	1257	410	186	4X	0500-4185
800, 1000	73.5	1867	32.5	826	19.5	495	49.5	1257	410	186	3R, 12	0310-0457
											4	0310-0449
											4X	0500-4185
1200	90.0	2286	39.0	991	27.0	698	63.0	1600	730	331	3R, 12, 4, 4X	A030L411

Transfer switch lug capacities

All lugs accept copper or aluminum wire unless indicated otherwise.

Transfer switch ampere	Cables per phase	Size
40, 70, 125 3-pole	1	#12 AWG-2/0
40 4-pole	1	#12 AWG-2/0
70, 125 4-pole	1	#6 AWG - 300 MCM
150, 225	1	#6 AWG - 300 MCM
260	1	#6 AWG - 400 MCM
300, 400	1	3/0 - 600 MCM
300, 400	2	3/0 - 250 MCM
600	2	250 - 500 MCM
800	4	250 - 500 MCM
1000,1200	4	#2 AWG-750 MCM

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Submittal detail

Amperage ratings
- ☐ 40
- ☐ 70
- ☐ 125
- ☐ 150
- ☐ 225
- ☐ 260
- ☐ 300
- ☑ 400
- ☐ 600
- ☐ 800
- ☐ 1000
- ☐ 1200

Voltage ratings
- ☐ R020 120
- ☐ R038 190
- ☐ R021 208
- ☐ R022 220
- ☐ R023 240
- ☐ R024 380
- ☐ R025 416
- ☐ R035 440
- ☑ R026 480
- ☐ R027 600

Pole configuration
- ☐ A028 Poles - 3 (solid neutral)
- ☑ A029 Poles - 4 (switched neutral)

Frequency
- ☑ A044 60 Hertz
- ☐ A045 50 Hertz

Application
- ☑ A035 Utility to genset

System options
- ☐ A041 Single phase, 2-wire or 3-wire
- ☑ A042 Three phase, 3-wire or 4-wire

Enclosure
- ☐ B002 Type 3R: intended for outdoor use, provides some protection from dirt, rain and snow (similar to IEC Type IP34)
- ☐ B003 Type 4: indoor or outdoor use, provides some protection from wind-blown dust and water spary (similar to IEC Type IP65)
- ☐ B010 Type 12: indoor use, some protection from dust (similar to IEC Type IP61)
- ☐ B025 Type 4X: stainless steel, indoor or outdoor use, provides some protection from corrosion (similar to IEC Type IP65)

Standards
- ☑ A046 UL 1008/CSA certification
- ☐ A080 Seismic certification

Control voltage
- ☐ M033 12V, Genset starting voltage
- ☑ M034 24V, Genset starting voltage

Control options
- ☐ J030 External exercise clock
- ☑ M032 Elevator signal relay

Battery chargers
- ☐ K001 2 amps, 12/24 volts
- ☐ KB59 15 amps, 12 volts
- ☐ KB60 12 amps, 24 volts

Auxiliary relays

Relays are UL Listed and factory installed. All relays provide (2) normally closed isolated contacts rated 10 A @ 600 VAC. Relay terminals accept (1) 18 gauge to (2) 12 gauge wires per terminal.

- ☐ L101 24 VDC coil - installed, not wired (for customer use).
- ☐ L102 24 VDC coil - emergency position - relay energized when switch is in source 2 (emergency) position.
- ☐ L103 24 VDC coil - normal position - relay energized when switch is in source 1 (normal) position
- ☐ L201 12 VDC coil installed, not wired (for customer use)
- ☐ L202 12 VDC coil - emergency position - relay energized when switch is in source 2 (emergency) position
- ☐ L203 12 VDC coil - normal position - relay energized when switch is in source 1 (normal) position

Miscellaneous options
- ☑ C027 Cover - guard
- ☐ M003 Terminal block - 30 points (not wired)

Optional lug kits
- ☐ N032 Lug adapters, compression, ½ stab
- ☐ N045 Cable lugs, mechanical, 600 MCM, 4 per pole
- ☐ N066 Cable lugs, mechanical, 750 MCM, 4 per pole

Warranty
- ☐ G009 1 year comprehensive
- ☐ G004 2 year comprehensive
- ☐ G006 5 year basic
- ☑ G007 5 year comprehensive
- ☐ G008 10 year major components

Shipping
- ☐ A051 Packing - export box (800-1000 A)

Accessories
- ☐ AC-170 Accessories specifications sheet

Cummins Power Generation

Americas
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574 5000
Fax: 763 574 5298

Europe, CIS, Middle East and Africa
Manston Park Columbus Ave.
Manston Ramsgate
Kent CT 12 5BF United Kingdom
Phone 44 1843 255000
Fax 44 1843 255902

Asia Pacific
10 Toh Guan Road #07-01
TT International Tradepark
Singapore 608838
Phone 65 6417 2388
Fax 65 6417 2399

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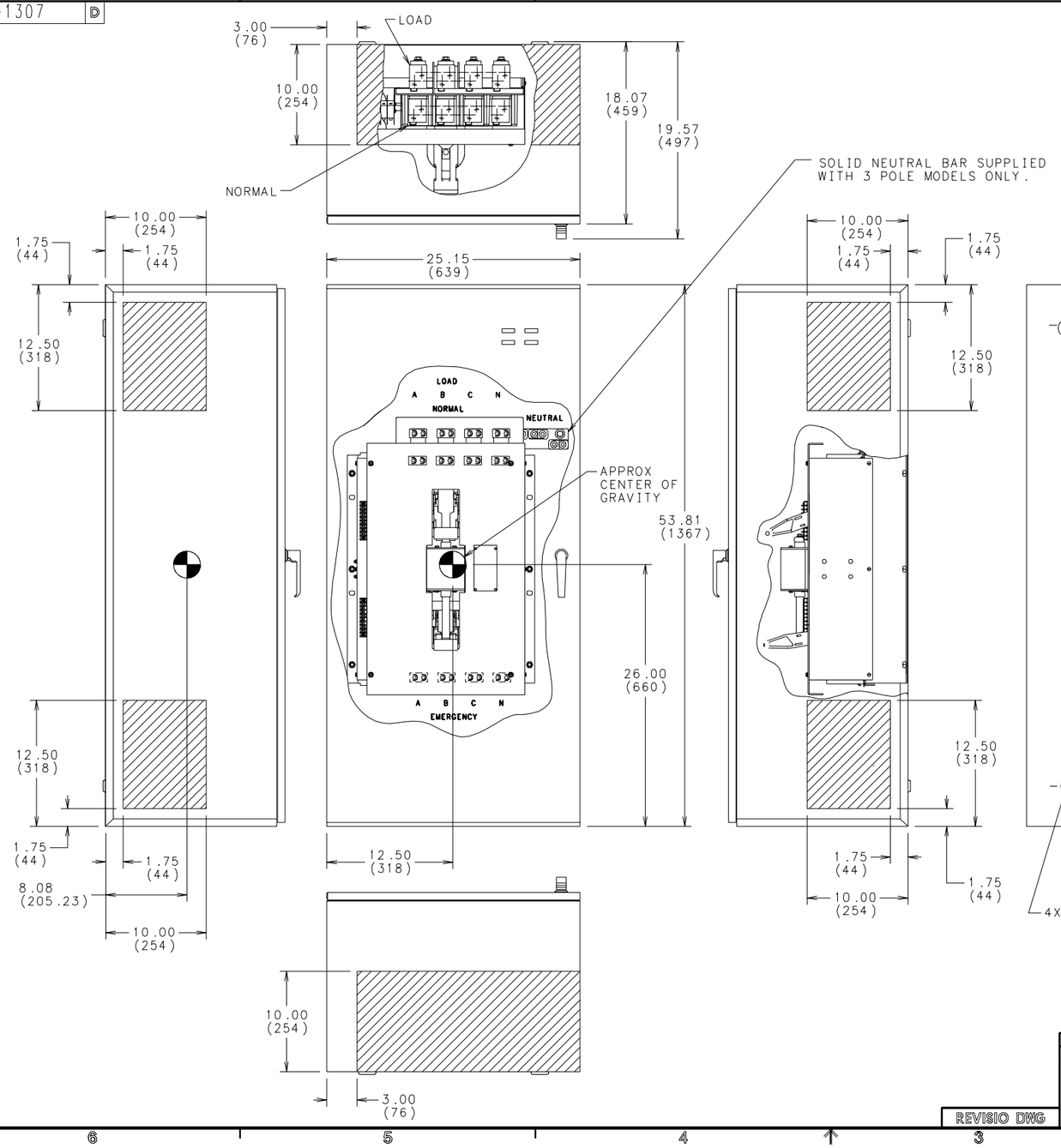
0310-1307 D

ER NO.	LTR	NO.	REVISION	ZONE	DR	CHKR	APPROVED	DATE
FR01608	A	1	PRODUCTION RELEASE	-	LK	LHS	L.SWITH	05-19-99
FR05274	B	1	WAS 4-250 (120) MCM CU-AL QTY 1	2-C	DD	LHS	L.SWITH	04-13-00
FR01737I	C	1	DIM 18.07 (459) WAS 18.07 (459)	4-D	RWM	BG	L.SWITH	08-05-03
		2	DIM 19.57 (497) WAS 19.57 (459)	4-D	RWM	BG	L.SWITH	08-05-03



NOTES:

1. UL TYPE 1 ENCLOSURE
2. APPROX. WEIGHT: 225 LBS
   MASS: 102 kg
3. DIMENSIONS IN ( ) ARE MILLIMETRES.
4. LUG CAPACITY: 300, 400 AMP
   (QUANTITY 1 WIRE) 3/0-600 (95-300) MCM CU-AL
   (QUANTITY 2 WIRES) 3/0-250 (25-120) MCM CU-AL
   LUG CAPACITY: 600 AMP
   (QUANTITY 2 WIRES) 250-500 (120-240) MCM CU-AL.
5. USE SEPARATE CONDUITS FOR CONTROL WIRING AND POWER WIRING. DO NOT COMBINE.
6. SHADED AREA INDICATES WIRING AND CABLE ENTRANCE AREA DO NOT INSTALL OUTSIDE OF SHADED AREA.
7. WIRE BENDING SPACE CONFORMS TO NEC TABLE 373-6 (B).
8. REFER TO NATIONAL ELECTRIC CODE, ARTICLE 110-16 WHICH STATES THE REQUIREMENT FOR THE MINIMUM CLEAR SPACE IN FRONT OF THIS UNIT.
9. 4 POLE SWITCHED NEUTRAL TRANSFER SWITCH SHOWN. A SOLID NEUTRAL BAR IS PROVIDED WITH 3 POLE TRANSFER SWITCHES.

3 AND 4 POLE

REVISIO DWG

DO NOT SCALE PRINT

TOLERANCE UNLESS OTHERWISE SPECIFIED

mm	inch
X ± .X	.X ± .X
.XX ±	.XX ±
.XXX ±	.XXX ±
0.00-1.99 ±0.13/-0.08	.XX-.240 ±.005/-.003
2.00-3.99 ±0.25/-0.18	.241-.437 ±.008/-.004
4.00-17.99 ±0.25/-0.13	.438-.783 ±.010/-.005
17.30-24.99 ±0.38/-0.13	.224-.999 ±.013/-.005
ANG TOL ±	DRAWN TO SCALE OF 3/16

QTY

SIM TO CERTIFIED FROM 0310-0416 D

THIRD ANGLE PROJECTION

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ITEM	PART NO.	DWG SIZE	DESCRIPTION OR MATERIAL	REF DES

	NAME	DATE
DR	L. KAPLAN	05-18-99
CHKR	L. SMITH	05-18-99
MFG		
APPROVED	L. SMITH	05-18-99

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ANSI Y14.5M-1982

MODEL FIRST USED ON OTPC 300-600A

Cummins Onan

MINNEAPOLIS, MINNESOTA 55432

TITLE OUTLINE-CONTROL BOX

DWG NO. 0310-1307

SHEET 1 of 1

DWG SIZE D

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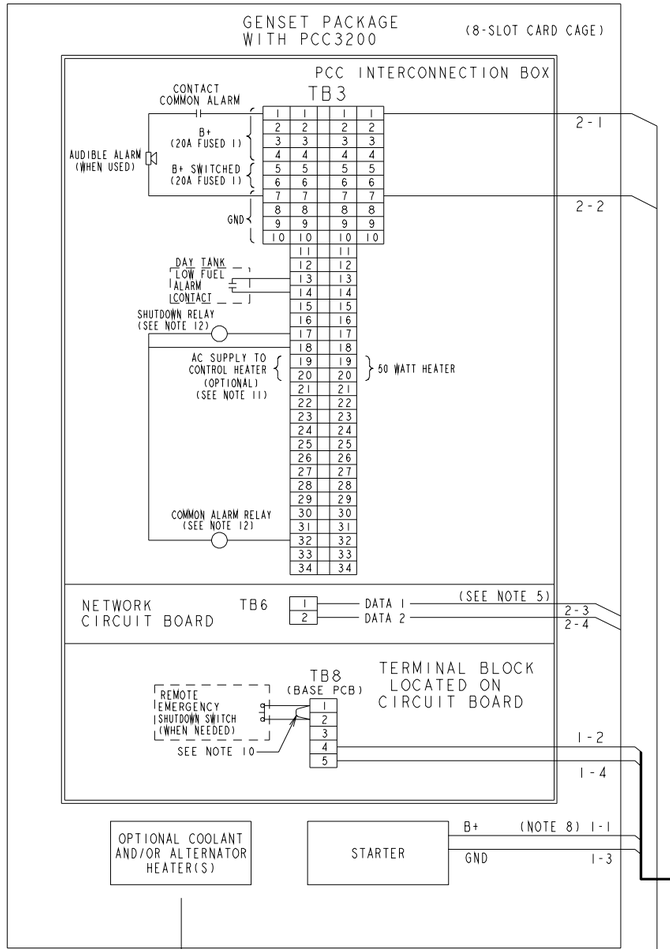
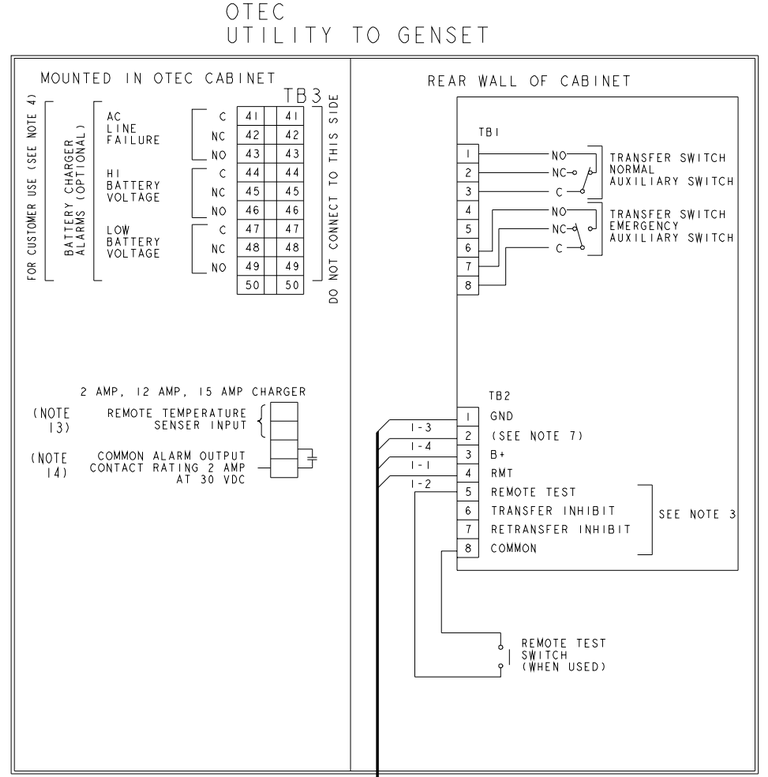
0630_2810 | D | Pro/ENGINEER | METRIC DWG





(NOTE 1)

WIRE SIZE (AWG)	DISTANCE IN FEET, ONE WAY (MULTIPLY BY 0.3 FOR METERS)				
	A	B	C	D	E
16	1000	90	-	50	-
14	1600	150	20	80	5
12	2400	225	30	125	10
10	4000	350	50	200	15
8	-	600	80	300	25
6	-	1000	125	500	40

REL NO	LTR	NO	REVISION	ZONE	DR	CHKR	APPROVED	DATE
FRD19505	A	1	PRODUCTION_RELEASE	-	GAC	JTM	MILLER	03-24-04
FRD22293	B	1	REVISED PER ECOR	-	LJK	JEM	MILLER	02-04-05
		2	SEE SHEET 2	-	LJK	JEM	MILLER	02-04-05
		3	SEE SHEET 3	-	LJK	JEM	MILLER	02-04-05
		4	SEE SHEET 4	-	LJK	JEM	MILLER	02-04-05
		5	SEE SHEET 5	-	LJK	JEM	MILLER	02-04-05
		6	SEE SHEET 6	-	LJK	JEM	MILLER	02-04-05
		7	SEE SHEET 7	-	LJK	JEM	MILLER	02-04-05
		8	SEE SHEET 8	-	LJK	JEM	MILLER	02-04-05
		9	SEE SHEET 9	-	LJK	JEM	MILLER	02-04-05
FRD24637	C	1	SEE SHEET 7	-	LJK	JEM	VOISSEM	07-26-05
		2	SEE SHEET 9	-	LJK	JEM	VOISSEM	07-26-05
		3	SEE SHEET 9	-	LJK	JEM	VOISSEM	07-26-05
		4	SEE SHEET 9	-	LJK	JEM	VOISSEM	07-26-05
FRD24920	D	1	REVISED PER ECOR	-	JFM	BN	B NESS	09-07-05

NOTES:

1. WIRE SIZES MUST BE AS FOLLOWS:
   RUN #1-GENSET TO TRANSFER SWITCH-LEAD SIZE MUST BE INCREASED IF A BATTERY CHARGER IS INSTALLED IN THE SWITCH.
   WITH NO BATT CHARGER-LEADS 1-1, -2, -3, -4, -5 USE COL A.
   WITH 2 AMP CHARGER, MAXIMUM VOLTAGE DROP OF 1.5 VOLTS, LEADS 1-1, &1-3 USE COL B.
   WITH 12/15 AMP CHARGER MAXIMUM VOLTAGE DROP OF 1.5 VOLTS, LEADS 1-1 & 1-3 USE COL. C.
   WITH 2 AMP CHARGER, MAXIMUM VOLTAGE DROP OF 0.75 VOLTS, LEADS 1-1, &1-3 USE COL D.
   WITH 12/15 AMP CHARGER, MAXIMUM VOLTAGE DROP OF 0.75 VOLTS, LEADS 1-1, & 1-3 USE COL E. TO MEET THE NFPA110 REQUIREMENT TO RETURN A FULLY DISCHARGED BATTERY TO 100% OF IT'S AMPERE-HOUR RATING WITHIN 24 HOURS USE COL. E.
2. FOR MULTIPLE TRANSFER SWITCHES, DUPLICATE RUN #1 FOR EACH SWITCH. DAISY CHAIN CONNECTION IS ACCEPTABLE PROVIDED WIRE SIZE & DISTANCE TO THE LAST SWITCH MEET THE SPECS IN NOTE 1.
3. CONNECT AN OPEN DRY CONTACT BETWEEN THE APPLICABLE TERMINAL AND COMMON (TB2-8). FOR REMOTE TEST, TRANSFER INHIBIT AND RETRANSFER INHIBIT TO ACTIVATE.
4. CONTACTS RATED: 4 AMPS AT 30 VDC OR 120V MAX.
5. REFER TO ONAN 900-0529 POWERCOMMAND NETWORK INSTALLATION & OPERATION MANUAL FOR WIRING INSTRUCTIONS, WIRE SIZE, AND LENGTH. USE STRANDED TWISTED PAIR WIRES WHEN CONNECTING DATA1 AND DATA2 TO NETWORK. PART # 0334-1350 OR EQUAL.
6. INPUTS FOR CUSTOMER FAULTS. GROUNDED SIGNAL REQUIRED TO ACTIVATE INPUT (MAX 50 MA.)
7. ON PCC 3200 CONTROLS NO JUMPER IS REQ'D BETWEEN TB1-1 & TB1-2.
8. CONFIGURATION SHOWN IS FOR ATS-MOUNTED BATTERY CHARGER. IF WALL-MOUNTED CHARGER IS USED, CONNECT B+ AND GND FROM CHARGER DIRECTLY TO BATTERY OR STARTER.
9. TRANSFER SWITCH SHOWN CLOSED TO NORMAL.
10. OPEN CONNECTION TO INITIATE EMERGENCY STOP THESE TERMINALS MUST BE SHORTED TOGETHER IF REMOTE EMERGENCY STOP OPTION NOT USED. JUMPER SHOWN BETWEEN TB8-1 AND TB8-2 NOT SUPPLIED WITH UNIT.
11. 120VAC OR 240VAC AT 50W.
12. CUSTOMER SUPPLIED EITHER 12 OR 240VDC RELAYS OUTPUT SIGNAL 20ma @ 24VDC MAX.
13. USE THE INVENTER REMOTE TEMPERATURE PROBE (0193-0530).
14. THE FOLLOWING FAILS WILL CAUSE A BATTTERY CHARGER ALARM OUTPUT: LOW BATTERY VOLTAGE, HIGH BATTERY VOLTAGE, LOW AC INPUT VOLTAGE, HIGH AC INPUT VOLTAGE OVERCURRRENT, HIGH CHARGER TEMPERATURE, BATTERY FAILURE, HIGH BATTERY TEMPERATURE (NOT AVAILABLE ON 2 AMP CHARGER).

DO NOT SCALE PRINT

TOLERANCE UNLESS OTHERWISE SPECIFIED

DIM	mm	inch
	X ± 1	.X ±
	.X ± 0.6	.XX ±
	.XX ± 0.38	.XXX ±
ANG TOL ± 1.0°	0.00-6.99 ±0.15/-0.00	.000-.280 +.006/-.000
	5.00-9.99 ±0.20/-0.10	.281-.421 +.008/-.004
	10.00-17.49 ±0.25/-0.13	.422-.703 +.010/-.005
DRAWN TO 1/1 SCALE OF	17.50-29.99 ±0.30/-0.13	.704-.999 +.012/-.005

DWG NO 0630_1974 | QTY D

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THIRD ANGLE PROJECTION

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ITEM	PART NO	QTY	DESCRIPTION OR MATERIAL	REF DES

	NAME	DATE
DR	G_COLLEEN	02-13-04
CHKR	J MILLER	02-13-04
APPROVED	J MILLER	02-13-04

MFG OTEC

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ANSI Y14.5M-1982

MODEL FIRST USED ON

SITE CODE PGA

CUMMINS POWER GENERATION
4600 23RD AVE NE
MINNEAPOLIS, MINNESOTA 55432

TITLE WD-INTERCONNECTION

DWG NO 0630_2810 | SHEET 1 of 9 | REV D

PowerCommand®
Remote Annunciator Panel
(LonWorks System annunciator)

> Specification sheet

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Power Generation

Description

The PowerCommand® Network Annunciator is a network component that provides remote system status indication for emergency and other power systems in compliance to the requirements of NFPA 110. The network annunciator may also be used for remote indication of any condition that is monitored by a PowerCommand Network.

The Network Annunciator reduces installation costs and improves design flexibility by use of a PowerCommand Network to transmit all the genset and transfer switch system signals rather than using relay contacts for this purpose.

Control power for PowerCommand Network products is usually derived from the genset starting batteries. The control functions over a voltage range from 8 VDC to 35 VDC.

Features

- Visual indication of 20 network conditions and network status.
- Audible indication of any network condition - Annunciator also includes pushbutton switch to silence the audible alarm. Alarm horn sound level is approximately 90 dB(A) at 30 cm.
- Standard NFPA 110 label, field configurable for other alarm and status conditions.
- Configurable for compliance to NFPA 99 requirements.
- Sealed membrane panel design provides environmental protection for internal components and is easy to clean.
- Warranty - PowerCommand Controls are supported by a worldwide network of independent distributors who provide parts, service and warranty support.
- UL Listed and labeled; CSA certified; CE marked.
- Wall mount NEMA 1 enclosure or flush mount configurations available.

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S-1343e (9/07)

Specifications

Signal requirements

Network connections: Echelon® LonWorks®, twisted-pair 78 kbps, FT-10.

Control power: 8-30 VDC, 3.5 W (maximum) 0.8 W typical.

Wiring materials for network signals are UL Listed 4 twisted pair wiring. Terminations for control power accept wire up to 16 ga.

Environment

The annunciator is designed for proper operation in ambient temperatures from -40 °C to +70 °C (-40 °F to +158 °F) and for storage from -40 °C to +80 °C (-40 °F to +176 °F). Control will operate with humidity up to 95%, non-condensing and at altitudes up to 5000 m (13,000 ft).

Alarm Horn

Sound Level: 90 dB(A) at 30 cm

Physical

Weight: 1.45 kg (3.2 lbs) (board plus enclosure)

Power

Maximum Consumption: 5 W
Standby Consumption: 0.4 W or less
Network Length: Maximum 1400 m (4600 ft), when using NEMA Level 4 cable

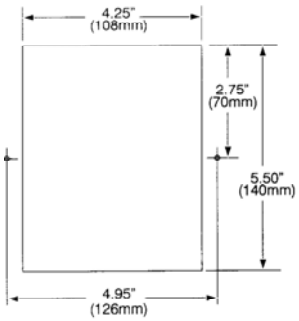
Self-binding configurations - Supports use of up to four annunciators with up to one genset and one transfer switch.

Maximum wire lengths - control power-self-binding system

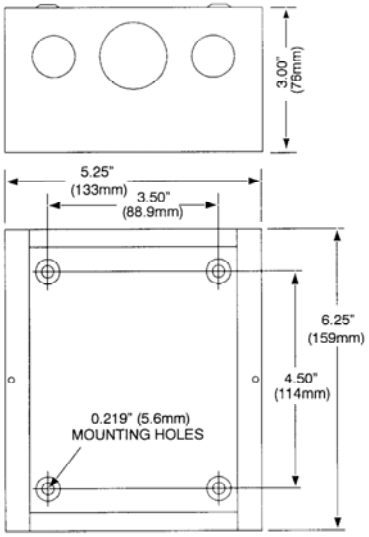
Wire size	12 VDC	24 VDC
22 ga	100 m (330 ft)	338 m (1100 ft)
20 ga	158 m (520 ft)	537 m (1760 ft)
18 ga	250 m (820 ft)	852 m (2790 ft)
16 ga	398 m (1300 ft)	1352 m (4430 ft)
14 ga	631 m (2070 ft)	1400 m (4600 ft)

Dimensions

Cut out detail (without enclosure)



Annunciator enclosure



Dimensions: in (mm)

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S-1343e (9/07)

Label configurations & standard bindings

NFPA 110 genset alarm and status annunciator

The following conditions are provided as standard on the annunciator:

- High battery voltage (A)
- Low battery voltage (A)
- Genset running (G)
- Genset supplying load (G)
- Pre-low oil pressure (A)
- Low oil pressure (R)
- Pre-high coolant temperature (A)
- High coolant temperature (R)
- Low engine temperature (A)
- Overspeed (R)
- Fail to start (overcrank) (R)
- Not in auto (R)
- Battery charger malfunction (A)
- Low fuel (A)
- Low coolant level (R)
- Spare (4) (G)
- Common alarm

(A) = Amber; (R) = Red; (G) = Green

Extended genset alarm and status annunciator

The following conditions are provided as standard on the annunciator:

- Check genset (R)
- Ground fault (A)
- High AC voltage (R)
- Low AC voltage (R)
- Under frequency (R)
- Overload (R)
- Over current (R)
- Short circuit (R)
- Reverse KW (R)
- Reverse kVAR (R)
- Fail to sync (A)
- Fail to close (R)
- Load demand (G)
- Genset CB tripped (R)
- Utility CB tripped (R)
- Emergency stop (R)
- Spare (4) (G)

(A) = Amber; (R) = Red; (G) = Green

8-Point (genset)

The following conditions are provided as standard on the annunciator:

- Check genset (A)
- Genset supplying load (A)
- Genset running (G)
- Not in auto (G)
- High/low engine temp (G)
- Low oil pressure (A)
- Low coolant level (R)
- Low fuel level (A)
- Spare (8) (G)

(A) = Amber; (R) = Red; (G) = Green

4-Point (genset)

The following conditions are provided as standard on the annunciator:

- Check genset (A)
- Genset supplying load (A)
- Genset running (G)
- Not in auto (G)
- Spare (16) (G)

(A) = Amber; (R) = Red; (G) = Green

ATS-extended

This annunciation set is often used with PLT-series equipment. The following conditions are provided as standard on the annunciator:

- Source 1 available (G)
- Source 2 available (G)
- Source 1 connected (G)
- Source 2 connected (G)
- Check ATS (R)
- ATS not in auto
- Test/exercise
- Transfer pending
- Load shed
- Transfer inhibit
- Fail to close
- Fail to disconnect
- Fail to synchronize
- Low battery-controller
- Low battery-network

(A) = Amber; (R) = Red; (G) = Green

ATS 8-point

The following conditions are provided as standard on the annunciator:

- Source 1 available (G)
- Source 2 available (G)
- Source 1 connected (G)
- Source 2 connected (G)
- Common alarm (A)
- Not in auto (R)
- Test/exercise mode (A)
- Low control battery (A)
- Spare (8) (G)

(A) = Amber; (R) = Red; (G) = Green

ATS 4-point

The following conditions are provided as standard on the annunciator:

- Source 1 available (G)
- Source 2 available (G)
- Source 2 connected (G)
- Source 1 connected (G)

(A) = Amber; (R) = Red; (G) = Green

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S-1343e (9/07)

Custom alarm configuration

#	Color (R/Y/G)	Label	Horn (Y/N)	#	Color (R/Y/G)	Label	Horn (Y/N)
1				11			
2				12			
3				13			
4				14			
5				15			
6				16			
7				17			
8				18			
9				19			
10				20			

Ordering information

Part number	Description
0541-0814-01	Network annunciator, open construction, for panel mounting
0541-0814-02	Network annunciator including control box for surface wall mounting

See your distributor for more information.

Cummins Power Generation

Americas
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574 5000 USA
Fax: 763 574 5298

Europe, CIS, Middle East and Africa
Manston Park Columbus Ave.
Manston Ramsgate
Kent CT 12 5BF United Kingdom
Phone 44 1843 255000
Fax 44 1843 255902

Asia Pacific
10 Toh Guan Road #07-01
TT International Tradepark
Singapore 608838
Phone 65 6417 2388
Fax 65 6417 2399

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S-1343e (9/07)

POWERCOMMAND NETWORKS

NETWORK CABLING AND CONNECTIONS FOR FTT-10 NETWORKS

Network Topology

FTT-10 networks are designed to support free topology wiring, and will accommodate bus, star, ring, or any combination of these topologies. Excepting the double-terminated bus topology, only one point of termination is required for any free topology segment. Note that the actual termination circuit will vary by application (See "Cable Termination" below.)

Network Nodes

Each device with an FTT-10 transceiver is a network node. The maximum number of nodes on a network segment and on the total network is partly dependant on the network application. For example, a network that is connecting only a few discrete variables between devices and has no monitoring software attached could probably support 64 nodes (maximum allowable on a segment per Echelon specs.) At the other extreme, a network with a large amount of inter-device bindings and being monitored by PowerCommand PULSE with Reporting option would not be able to support more than 12 devices using a single FTT-10 channel. However, with the appropriate addition of other network management devices, the PULSE example could potentially support 64 devices or even more. If there is any question about how many devices your network can support, contact the Network Applications Engineer in the CPG System Sales department.

Network Cable Selection

The following cables are qualified for use with FTT-10 networks:

- NEMA Level IV cable (Onan P/N 334-1350 [PVC] or 334-1351 [Plenum])
- Belden 85102 or Belden 8471 (both are single twisted pair, 16 AWG)

Network wiring should be run in separate conduit and installed following local electrical codes. Any wire connected to Generator Sets must be stranded wire (NFPA110, Para. 7.12.4.1). Except when using ring topology, cabling is not polarity sensitive. The average temperature of the wire should not exceed +55ºC (+131ºF). Cable distance must comply with transmission specifications listed below. The *maximum total wire length* is the total length of wire within a segment. The *maximum node-to-node distance* is the maximum allowable distance between each individual node or the terminator.

Table 1 Free Topology

	Maximum node-to-node distance (Ft)	**Maximum total Wire length (Ft)**
Belden 8471	1300	1600
Belden 85102	1600	1600
NEMA Level IV	1300	1600
-		

Table 2 Double-Terminated Bus Topology

	Maximum Bus length (Ft)
Belden 8471	8800
Belden 85102	8800
NEMA Level IV	4500
-	

A double-terminated bus may have stubs of up to 10 feet from the bus to each device.

Cable Termination

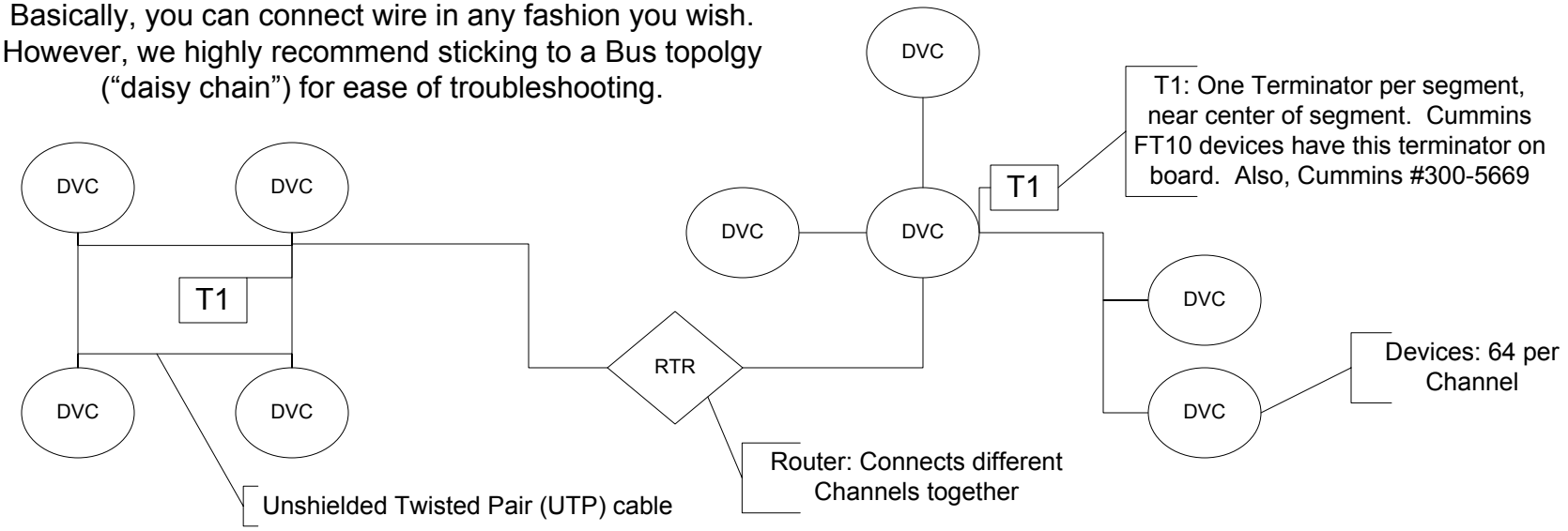
FTT-10 network segments require termination for proper data transmission performance. Free topology and Double-terminated Bus topology networks differ in their termination requirements.

Free topology segments only require one terminator per segment. This terminator can be placed anywhere in the segment, but is recommended to be placed near the middle of the segment. All PowerCommand network interface modules (i.e. GCM, NCM, GLC), Control Communications Modules (CCM), Digital I/O Modules (DIM) and Lonworks Annunciators have an on-board free topology terminator. It is recommended that this be used on a free topology segment. Optionally an external free topology terminator (Onan P/N 0300-5669) can be used.

Double-terminated Bus segments must be terminated at both ends of the segment. An FTT-10 Bus terminator (Onan P/N 0300-5729) must be used.

FT-10 Physical Wiring: Method 1, Free Topology

Basically, you can connect wire in any fashion you wish. However, we highly recommend sticking to a Bus topolgy ("daisy chain") for ease of troubleshooting.



Note: Although LonMaker says that you can have 2 segments to a channel, we are not confident in this, so stick to a maximum of 64 devices, 1 segment per channel

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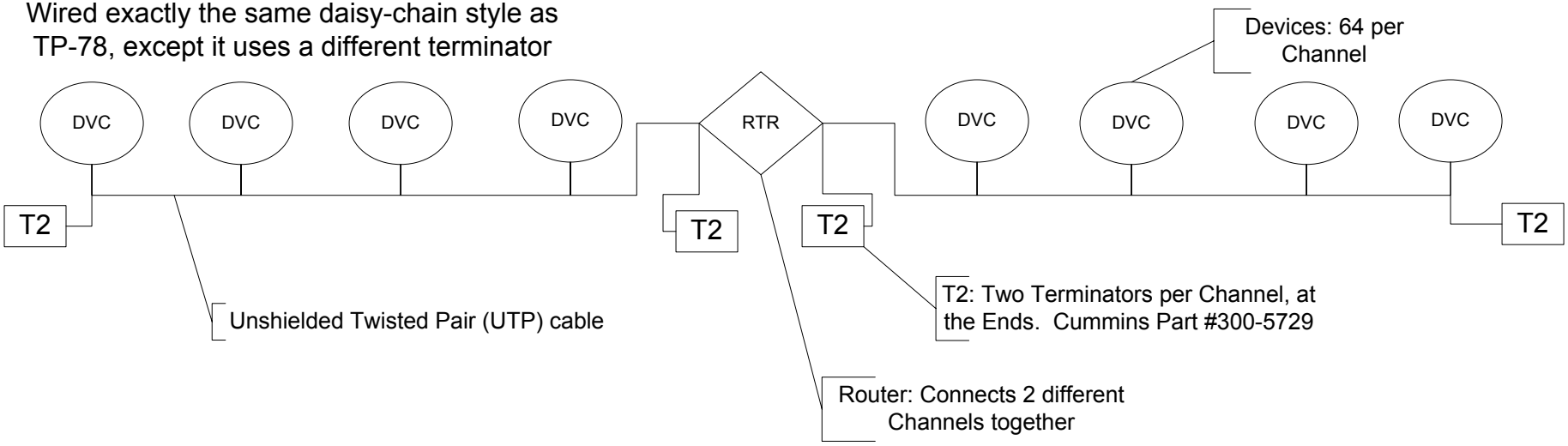
FT-10 Physical Wiring: Method 2, Multi-Drop Bus

Wired exactly the same daisy-chain style as TP-78, except it uses a different terminator



Commercial
Extended Warranty Statements

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Cummins Power Generation

Commercial Extended Warranty Statements

Feature Codes
L040
L093
L029
L030
L031
L041

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Power Generation

Limited Standby 5 Year or 1,500 hour Basic Extended Warranty – L030

Commercial Generating Set

When purchased, this limited extended warranty applies to Cummins Power Generation® branded commercial generating sets and associated accessories (hereinafter referred to as "Product").

This warranty covers any failures of the Product, under normal use and service, which result from a defect in material or factory workmanship.

Warranty Period:

The warranty start date is the date of initial start up, first rental, demonstration or 18 months after factory ship date, whichever is sooner. The coverage duration is 5 years from warranty start date or 1,500 hours or whichever occurs first.

Emergency Standby Power (ESP) is defined as the maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage. The permissible average power output over 24 hours of operation shall not exceed 70% of the ESP.

Cummins Power Generation® Responsibilities:

In the event of a failure of the Product during the extended warranty period due to defects in material or workmanship, Cummins Power Generation® will only be responsible for the following costs:

- All parts required to repair the Product.

Owner Responsibilities:

The owner will be responsible for the following:

- Notifying Cummins Power Generation® distributor or dealer within 30 days of the discovery of failure.
- Installing, operating, commissioning and maintaining the Product in accordance with Cummins Power Generation®'s published policies and guidelines.
- Providing evidence for date of commissioning.
- Providing sufficient access to and reasonable ability to remove the Product from the installation in the event of a warrantable failure.

In addition, the owner will be responsible for:

- Incremental costs and expenses associated with Product removal and reinstallation resulting from non-standard installations.
- Costs associated with rental of generating sets used to replace the Product being repaired.
- Costs associated with labor overtime and premium shipping requested by the owner.
- Labor and travel after the base warranty period expires.
- All downtime expenses, fines, all applicable taxes, and other losses resulting from a warrantable failure.

Limitations:

This limited extended warranty does not cover Product failures resulting from:

- Inappropriate use relative to designated power rating.
- Inappropriate use relative to application guidelines.
- Normal wear and tear.
- Improper and/or unauthorized installation.
- Owner's or operator's negligence, accidents or misuse.
- Lack of maintenance or unauthorized repair.
- Noncompliance with any Cummins Power Generation® published guideline or policy.
- Use of improper or contaminated fuels, coolants or lubricants.
- Improper storage before and after commissioning.

- Owner's delay in making Product available after notification of potential Product problem.
- Use of steel enclosures within 60 miles of the coast of salt water when aluminum or an alternate non-corrosive material enclosure option is available.
- Replacement parts and accessories not authorized by Cummins Power Generation®.
- Use of Battle Short Mode.
- Owner or operator abuse or neglect such as: operation without adequate coolant or lubricants; overfueling; overspeeding; lack of maintenance to lubricating, cooling or air intake systems; late servicing and maintenance; improper storage, starting, warm-up, run-in or shutdown practices, or for progressive damage resulting from a defective shutdown or warning device.
- Damage to parts, fixtures, housings, attachments and accessory items that are not part of the generating set.

This limited extended warranty does not cover costs resulting from:

- Difficulty in gaining access to the Product.
- Repair of cosmetic damage to enclosures.

Items not covered by this limited extended warranty:

- Batteries
- Enclosures
- Coolant heating elements
- Maintenance items

Aftertreatment component failures

.

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CUMMINS POWER GENERATION® RIGHT TO FAILED COMPONENTS:

Failed components claimed under warranty remain the property of Cummins Power Generation®. Cummins Power Generation® has the right to reclaim any failed component that has been replaced under warranty.

THE WARRANTIES SET FORTH HEREIN ARE THE SOLE WARRANTIES MADE BY CUMMINS POWER GENERATION ® IN REGARD TO THE PRODUCT. CUMMINS POWER GENERATION® MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT IS CUMMINS POWER GENERATION® LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

This limited extended warranty shall be enforced to the maximum extent permitted by applicable law. This limited extended warranty gives the owner specific rights that may vary from state to state or from jurisdiction to jurisdiction.

Product Model Number:_____

Product Serial Number:_____

Date in Service:_____

Cummins

Power Electronics
Extended Warranty Statements

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Power Generation

Power Electronics Extended Warranty Statements

Feature Codes
G004
G006
G007
G008
G013

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Power Generation

Limited 5 Year Comprehensive Extended Warranty – G007

Transfer Switch and Paralleling Systems

When purchased, this limited extended warranty applies to all Cummins Power Generation® branded Transfer Switches, Paralleling Systems and associated accessories (hereinafter referred to as "Product").

This limited extended warranty covers any failures of the Product, under normal use and service, which result from a defect in material or factory workmanship.

Warranty Period:

The limited extended warranty start date is the date of commissioning†, demonstration or 18 months after factory ship date, whichever is sooner. The coverage duration is 5 years from warranty start date.

† Date of commissioning not to exceed date of Generator Set initial start-up.

Cummins Power Generation® Responsibilities:

In the event of a failure of the Product during the limited extended warranty period due to defects in material or workmanship, Cummins Power Generation® will only be responsible for the following costs:

- All parts and labor required to repair the Product.
- Reasonable travel expenses to and from the Product site location.

Owner Responsibilities:

The owner will be responsible for the following:

- Notifying Cummins Power Generation® distributor or dealer within 30 days of the discovery of failure.
- Installing, operating, commissioning and maintaining the Product in accordance with Cummins Power Generation®'s published policies and guidelines.
- Providing evidence for date of commissioning.
- Providing sufficient access to and reasonable ability to remove the Product from the installation in the event of a warrantable failure.

In addition, the owner will be responsible for:

- Incremental costs and expenses associated with Product removal and reinstallation resulting from non-standard installations.
- Costs associated with rental of power generating equipment used to replace the Product being repaired.
- Costs associated with labor overtime and premium shipping requested by the owner.
- All downtime expenses, fines, all applicable taxes, and other losses resulting from a warrantable failure.

Limitations:

This limited extended warranty does not cover Product failures resulting from:

- Inappropriate use relative to designated power rating.
- Inappropriate use relative to application guidelines.
- Non-conformance to applicable industry standards for installation
- Normal wear and tear.
- Improper and/or unauthorized installation.
- Owner's or operator's negligence, accidents or misuse.
- Lack of maintenance or unauthorized repair.
- Noncompliance with any Cummins Power Generation® published guideline or policy.
- Improper storage before and after commissioning.
- Owner's delay in making Product available after notification of potential Product problem.

- Use of steel enclosures within 60 miles of the coast of salt water when aluminum or an alternate non-corrosive material enclosure option is available.
- Replacement parts and accessories not authorized by Cummins Power Generation®.
- Owner or operator abuse or neglect such as: late servicing and maintenance and improper storage.
- Damage to parts, fixtures, housings, attachments and accessory items that are not part of the transfer switch or paralleling system.

This limited extended warranty does not cover costs resulting from:

- Difficulty in gaining access to the Product.
- Repair of cosmetic damage to enclosures.

CUMMINS POWER GENERATION® RIGHT TO FAILED COMPONENTS:
Failed components claimed under warranty remain the property of Cummins Power Generation®. Cummins Power Generation® has the right to reclaim any failed component that has been replaced under warranty.

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IN NO EVENT IS CUMMINS POWER GENERATION® LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

This limited extended warranty shall be enforced to the maximum extent permitted by applicable law. This limited warranty gives the owner specific rights that may vary from state to state or from jurisdiction to jurisdiction.

Product Model Number:_____

Product Serial Number:_____

Date in Service:_____

Cummins

Cummins Power Systems, LLC
Generator Set Start-Up Checklist

❑
914 Cromwell Avenue
Rocky Hill, CT 06067
860-529-7474
860-529-7041 (fax)

❑
1907 Park 100 Drive
Glen Burnie, MD 21061
410-590-8700
410-590-8728 (fax)

❑
41-85 Doremus Avenue
Newark, NJ 07105
973-491-0100
973-491-5477 (fax)

❑
890 Zerega Avenue
Bronx, NY 10473
718-892-2400
718-892-0055 (fax)

❑
2727 Ford Road
Bristol, PA 19007
215-785-6005
215-785-4099 (fax)

❑
4499 Lewis Road
Harrisburg, PA 17111
717-564-1344
717-214-2929 (fax)

❑
7701 General McClellan Road
Manassas, VA 20109
571-292-8740
571-292-8779 (fax)

Date: _____ Fax # : (_____) _____

Contractor: _____ Rep. Name: _____

The following items must be completed prior to initial generator set system start-up. Please review these items with on-site personnel and initial to the left of the item, sign at the bottom and fax back to Cummins Power Systems, LLC to ensure selected scheduling of generator set start-up. The following systems/items must be installed, checked, and operational prior to start-up in accordance with Onan installation requirements and Federal, State and Local codes. CPS LLC is not responsible for code compliance.

[ ] The **COOLING SYSTEM** is complete and operational, including coolant and coolant piping. Remote radiators must be pressure tested and drained prior to start-up. Contractor is responsible for assisting CPS LLC technician with filling remote radiators.

[ ] The **AIR HANDLING SYSTEM** is complete and operational, including all air ducting and louver installation of proper size and type to properly cool the engine/generator under full load conditions. This also includes all control wiring and run relays.

[ ] The **DIESEL FUEL SYSTEM** (as applicable) is complete with proper fuel line size, and adequate diesel fuel is available at the day tank/main tank for start-up and any specified building load tests and load bank tests.

[ ] The **NATURAL GAS/LPG FUEL SYSTEM** (as applicable) is complete with proper fuel line size, and fuel is available to the fuel solenoid at the proper pressure/volume. Minimum fuel pressure is _____ inches WC. Minimum flow is _____ CFH.

[ ] The **EXHAUST SYSTEM** is complete and operational including exhaust piping, thimbles, silencers, exhaust wraps and rain caps.

[ ] The **ELECTRICAL SYSTEM** wiring to include terminated and completed AC power and all control wiring. This includes wiring to all annunciators, solenoids, valves, louvers, run relays, dry contacts, APM's, block heaters, and battery chargers. CPS LLC technician will not pull wires / run conduit.

[ ] The **BLOCK HEATER** is wired to the proper AC voltage and circuit should not be energized. CPS LLC technician will energize block heater at start-up. This will prevent heater burn-out due to air in system or wrong supply voltage.

[ ] **NORMAL POWER IS AVAILABLE** at the automatic transfer switch, and building load is available for testing and ATS set-up. Adjustments after the initial start-up are not included in the start-up and are not covered by warranty.

[ ] The generator set should not be starting under load. If so, contractor is responsible for installing an emergency contactor.

[ ] The generator set area is clean and free of debris. Area must be swept prior to start of engine to avoid engine/radiator damage.

[ ] On generator sets over **100 kW**, contractor is responsible for assisting CPS LLC technician with transporting and installing starting batteries. Assisting with battery installation is an OSHA requirement due to the weight of the starting batteries.

[ ] The **END USERS/OWNERS** have been notified to be available at the initial start-up for operating instructions and system demonstration after 1 PM. This is the only demo CPS LLC will provide. Any additional requests for demonstrations are billable.

[ ] If a **LOAD BANK TEST** is listed in the Bill of Materials, contractor is responsible for providing direct lateral load bank access within 100 ft. of load bank placement. Provisions must be made for proper cooling and safety zones around trailer mounted load banks. Additional charges may be incurred for longer, vertical or difficult access. Load bank testing is dependent on acceptable weather as determined by CPS LLC,I personnel on day of load bank. CPS LLC will quote additional charges before job if they apply.

[ ] All required electrical and mechanical permits have been acquired. CPS LLC is not responsible for permitting.

[ ] **Any discrepancy** on the emergency generator power system has been brought to the attention of the CPS LLC sales or service staff in writing prior to initial start-up. All warranties begin on the start-up date regardless of building occupation or acceptance.

Job Name: _____ Start-Up Date Requested: _____

Authorized Signature: _____

Start-up must be scheduled with the service department at least **one week prior** to the requested start-up date. A completed and signed start-up checklist must be returned to the service department **48 hours prior** to the start-up date for confirmation. If the above items are not completed prior to start-up, the contractor is responsible for additional trips required to complete the start-up. If the end users/owners are not available at the start-up for operating instructions, the contractor is responsible for those instructions. Generator system start-ups are planned and scheduled for completion in one day. Credit Department approval must be received prior to Start-Up.

Please fax back to the appropriate number listed above 48 hours prior to start-up date.

Office use only!

Reviewed with on-site contractor representative _____ On _____ By: _____

(date) (CPS LLC employee)